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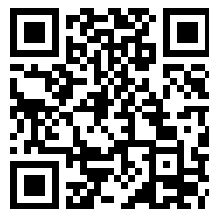
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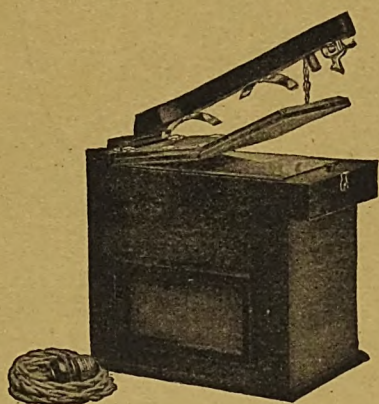
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The PHOTOGRAPHIC JOURNAL of AMERICA

A Monthly Magazine Devoted to the Science and Art of Photography

FRANK V. CHAMBERS, Publisher, 636 Franklin Square, Philadelphia
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PHILADELPHIA

THE HORIZON-LINE IN THE PICTURE— JOHN BARTLETT

A GOOD deal of the impressiveness of a picture depends upon the position occupied by the horizon. As a general thing, the horizon should tend to fall rather below the center of the view than above it and rarely is the effect good when it is directly central.

It is, however, not such an easy task for the photographer to strike the horizon line much below the medial line even when he puts the camera directly upon the ground.

On the sea coast, however, the raising or lowering of the camera does not affect the position of the horizon.

The case is the same with any other subject having a very distant horizon—With subjects where near objects form an initial feature of the picture a change in the height of the camera makes no material change in the picture, which is a matter often of consideration.

If the camera is placed high so that the horizon intersects the heads of the figures in the view, the result is rather unpleasant to the eye. Professional photographers often forget about the change made by the different elevation of the camera. The glaring incongruities of background and model in front of it—a fertile source of attack by the scornful pen of the painter—no longer obtains in studio work by reason of the application of true artistic study by the photographer.

His education has improved both his taste and judgment. But sometimes he forgets to make the practical application; for instance, landscape backgrounds are frequently used as background setting to a portrait and often with telling effect, but at times one sees a misapplication of background landscape to the model, annoying to the visual sense of the artist; who has understanding of artistic perspective. This unpleasant appearance is due to the position of the figure or figures against the horizon of the landscape.

If the horizon of the background is placed for a certain size of figure and the photographer poses the model so that the line is considerably above the head, the presentation looks strange and unnatural—if not impossible.

If the horizon is greatly depressed, the apparent massiveness of the figure suggests Gulliver in Lilliput.

If the horizon is inordinately high, the position of the figure remaining the same, the opposite result takes place, the figure is dwarfed and the objects in the landscape background look as if about to fall on the pigmy below.

Fortunately in the studio picture the horizon in the landscape is generally softened or obscured to a degree to prevent its obtrusiveness, and the unnatural effect is not so pronounced as it would be with a definitely indicated horizon.

The experiment of posing against a background is worth trying. The position of the figure against the horizon at, say thirty feet, with the camera up to the line of sight of the photographer, and the same figure at the same distance, but with the artist kneeling—that is, at about three feet from the ground, is very materially different.

In the latter position the landscape is reduced in vertical height so that the horizon comes about the center of the back instead of at the shoulders as it would in the former position.

The effect of placing the eye at different heights relative to the figure is often a revelation to the inexperienced photographer. The figure may be made to look taller or shorter than the normal height. Of course good judgment is demanded from the operator in estimating the proper means.

When Leslie painted the portrait of the Duke of Wellington and submitted it to the inspection of his patron, the Duke remarked that the head was represented too large and that the same fault was committed by all the distinguished painters for whom he sat. The Duke was a better warrior than an art critic and Leslie and his confrères knew better what their art required. Inferior painters invariably paint the head too small for the body and good art, like good portraiture with the camera, gives the seat of the intellect just proportions.

THE COMPOSITION OF THE FIXING-BATH— RICHARD PENLAKE

ALTHOUGH a dozen or more chemicals besides hyposulphite of soda have the power of dissolving free silver, not one of them has been so largely used as our old friend and enemy, hypo, for fixing negatives and prints. It was in the year 1819 that Sir John Herschel, the one time prince of experimentalists, discovered that hyposulphite of soda was a solvent for unreduced silver, but hypo, as it is commonly called today, was then a rare and expensive salt. It was so rare and costly that little or no further thought was given to it by the early photographers until the year 1837, when J. B. Reade began to use it for fixing a form of paper negative. The usefulness of hypo for the work quickly became known with the result that it dropped in price, in England, to half a crown per ounce (60 cents). In 1845 the price was lowered to six pence per ounce (12 cents), and twelve years later it had dropped to six pence per pound, since when it has become much cheaper.

The orthodox fixing solution, consisting only of hypo and water, always did its work, and will still do its work exceedingly well under favorable conditions, but the additions of other things to the simple solution have at various times been recommended, such additions being for the purpose of hastening the action of the hypo, for clearing the picture, or for hardening the film.

Alum was at one time advocated as an addition, because alum is a well-known hardener, but it has been proved over and over again that a solution of hypo and alum is one of the worst things it is possible to use. Photographers have been cautioned against it for many years and its defects and failings are probably only too well known. As a matter of fact hypo and alum make a good hardener, but



*Courtesy of Eduard Blum
Chicago*

G. J. VON DUEHREN
BERLIN

such a bath must be mixed properly, and other thing added in order to prevent the combination from causing trouble.

It is stated above that additions to the hypo bath are made for three special purposes, and while there may be many who are perfectly satisfied with a plain solution of hypo and water it cannot be denied that additions, when properly made, are of the greatest convenience and facilitate working. One may, of course, use clearers and hardeners after the normal fixing-bath, but they take time, and are not so effective, at times, as some would have us believe. Let us, however, consider the three purposes in the order they are given—hastening, clearing and hardening.

Strong hypo baths are not advisable and for many reasons. Strong hypo baths do not mean rapid fixing and many workers may have discovered that a saturated solution of hypo does not fix so rapidly as a weaker one. There is really no advantage in having a bath stronger than 8 ounces to 20 ounces of water; the average strength is 4 ounces in 20 ounces and it is not advisable to have it any weaker, but anything between the two will serve. The speed of fixing, however, does not increase in the same proportion as the added hypo. If a normal bath is to be quickened it may be accomplished better by adding sal ammoniac rather than extra hypo. The exact amount of sal ammoniac is of no great importance, and 1 ounce to every 3 ounces of hypo will be found to serve very well. A little potassium metabisulphite is also a help, and a suitable formula for the solution would be: Hypo, 20 ounces; sal ammoniac, 7 ounces; potassium metabisulphite, 1 ounce; water, 100 ounces. This is too strong for some plates and may be diluted with water. Rapidity of fixing, however, is not nearly so important as hardening and clearing.

Acid fixers are popular and are likely to remain strong favorites because of their many advantages for negatives and development papers. They remain clear in use, drive away all developing stains and arrest the action of the developer. Producers of developed prints will find them useful and great time-savers because of the possibility of transferring the picture direct from the developer to the fixer without any fear of staining. Acid fixers cannot be made by adding any acid to the hypo bath, and probably every worker has, at some time or another, added a few drops of sulphuric, hydrochloric or maybe some other acid to a solution of hypo, with the intention of rendering it acid, only to find the yellow precipitation of sulphur take place, with the accompanying evolution of sulphuretted hydrogen. The only crude acid which may be added in a more or less rough and ready way to a solution of hypo is sulphurous acid. The addition of 3 to 6 drops of sulphurous acid to each ounce of normal fixing solution, or, say 1 to 2 drams per pint, makes a very good acid fixer, and though on addition a faint odor may be detected, no precipitation should take place. The simplest fixing-bath, and at the same time one which complies with the chemical laws which regulate the composition of a bath of this kind, is made by adding a little potassium metabisulphite to the normal hypo solution. About half an ounce to one ounce of metabisulphite to each pint of fixer is a suitable quantity or should a definite formula be required the following may be taken: Hypo, 4 to 6 ounces; metabisulphite, 1 ounce; water to 20 ounces. The metabisulphite should be added to a cold solution, and should hot water be used to dissolve the hypo, the bath should be allowed to cool before adding. This bath is not so cheap as others made with sodium sulphite and an acid, but it acts splendidly and does not throw down sulphur with use.

Acid fixing-baths are said to harden gelatin films a little, but in order to secure the best and most effective hardeners in a combined form, other additions must be made. The metabisulphite bath given above may have its hardening powers increased by adding chrome alum and decreasing the metabisulphite. The chrome alum must, however, be dissolved in water before adding to the hypo mixture. The formula for the combined fixer, hardener and clearer stands as follows: In 70 ounces of water dissolve 16 ounces of hypo and $1\frac{1}{4}$ ounces of potassium meta-

bisulphite, then add 10 ounces of water in which $1\frac{1}{4}$ ounces of chrome alum have been dissolved, and strain before use.

The most widely used formula for a chrome alum and acid fixer, and one to be found in all text-books, is that containing chrome alum, hypo, soda sulphite and sulphuric acid. I do not repeat the formula here for the reason that I consider another formula so very much better. After trying all the formulæ I could hear about, or find in books and circulars, I have decided in favor of the following stock solution which is added to the normal fixing-bath: White powdered alum, 2 ounces; soda sulphite, 2 ounces; glacial acetic acid, $1\frac{1}{2}$ ounces; water to 10 ounces. One ounce of this added to every 15 ounces (or thereabouts) of normal hypo and water fixer makes one of the most perfect combined hardeners, clearers and fixers, I know of. It remains clear in use and the acetic acid is just strong enough in the diluted state to give off the most pleasing and refreshing odor imaginable, it is just the thing for hot and stuffy dark-rooms, unless, of course, the worker objects very strongly to the odor of vinegar.

Although I have not met with any difficulty when mixing the alum, sulphite and acetic acid in a more or less rough and ready manner, many get a deposit. The scientific and most proper method of mixing is to dissolve the sulphite in a little more than half of the water (made hot), then to add the acetic acid, next the alum and finally hot or cold water to make up the required bulk. Mixed in this way, one gets the bath quite clear and without any deposit of sulphur. Even when a slight sediment has formed, the bath may be used as usual, if permanency is not a great consideration. The bath, if milky, is difficult to filter and it is better to let the solution stand and settle; then pour off the clear portion for use.



"TO THE SEA." BERTRAM COX, F.R.P.S.

Although fixers which remain clear have so many advantages, they have one little drawback if the worker is careless, namely, when used continually for prints one is apt to overwork the baths and to imagine that they will do more than they are really capable of doing. It is easy enough to see when negatives are properly fixed, but the dissolving out of the unacted-upon silver from prints must always be guess-work. It is a good plan to test the power of acid fixers and this may be done very easily. When a dry plate is fogged or too old to use, cut it up into small pieces and keep in a box. Take a piece of it and immerse in the fixer to be used for prints, one can then judge roughly the power of the bath by the time the silver takes to disappear. It is of course advisable to use fresh fixers for prints, to keep the pictures on the move and to fix thoroughly, as an extra time in the bath does no harm to developed prints. When the acetic acid fixer and hardener is used, one may always detect the presence of the acid by the odor, but it is not an easy matter for the uninitiated to know how much hypo there is in it.

Another interesting point about acid fixers is that the after-washing should be a little longer than when plain hypo and water baths are used, because of acid fixers being a little more difficult to remove.

Plain hypo baths are all very well in a way, but there can be no denial of the fact that suitable additions for the purposes of hardening and clearing make the operation of fixing more of a pleasure.

STYLE AND INDIVIDUALITY— XANTHUS SMITH

THE style of the artist is after all merely his way of setting forth his ideas in his picture, and this applies to the photographic artist as well as it does to the painter. True, the principles of art in their application to photography are not so flexible, as in the hands of the painter, yet are they capable of allowing individual action in their employment. The trouble with some of the artistic aspirants with the camera is that they are, at times, presumptuous in ignoring conventional rules of art. But the question after all is—How far do any pictures, irrespective of their genesis, tend to the real object of fine art—the giving of pleasure to the beholder? If this is obtained, we ought not to demand adherence to conventional rules as the *sine qua non*. The public cares little for method. It is the effect produced and the excitation of pleasurable emotion.

We have the mysticism of Blake, the realism of Goethe and the spirituality of Wordsworth and each delights us in his individual way. And so when one painter lays on the paint so smoothly that no brush mark is perceptible, while another uses the palette knife, the trowel or maybe the fire shovel, we do not judge his results with reference to the means employed, but by the effect achieved.

"The visual sense is what pictorial art chiefly appeals to;"—this is art for art's sake, but most of us think that other faculties are excited—and most of us are right, although a picture is primarily a harmonious sensation upon the vision of color line, tone, light and shade falls short in attempting more in the other fine arts. Even in trying to tell a story, how inadequate it is. Literature in the title has often to enlighten us, but we were on the subject of style and individuality and must not digress. One must come to an understanding of terms and make a distinction between the honest endeavor for self-expression and the arrogance of the attempt to make something merely novel and strange—sensational—where the picture is made solely for the effect to startle or surprise, it reveals to us the assumed temperament of the artist and not his real individuality nor any evidence that his

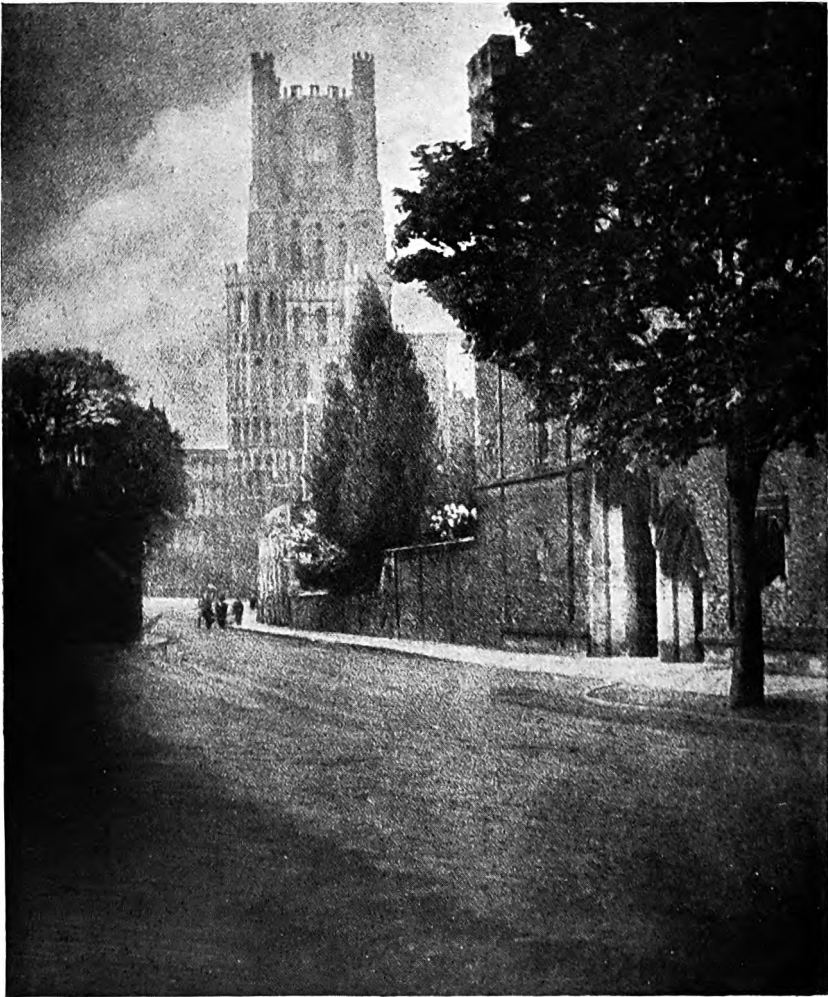
work is the index of his artistic perception. A good picture needs no poetic prop to help it to its place in art.

Art is really its own interpreter. Corot's and Daubigny's landscapes are beautiful to him who has never seen the local nature they depict. The fête scenes of the Dutch painters are still delightful though nameless and obscure. The titles affixed to Rembrandt's works add not one jot or tittle to our supreme interest in them.

He who pins his faith to one style only and deprecates all other styles, is exactly he who least perceives in his own elected style what its peculiar charm happens to be.

The bigot in art generally admires in the wrong direction, clings to what is merely accidental, failing to perceive what is essential, what is universal to all art, no matter how expressed.

We are prone to look on art as an inclosure where we can travel comfortably around in a circle, without risk of encountering opposition, rather than a vantage ground from which fresh discoveries may be made.



"AT ELY, EVENING." BERTRAM COX, F.R.P.S.

COLORING PORTRAIT ENLARGEMENTS IN OIL—ARTHUR TERRY

WITH the greater interest now manifested in all that pertains to the photographic art during the last decade is a desire among many to become acquainted with some of the popular means of finishing photographs, both large and small. It is to meet the wishes of such that the following hints are offered, giving instruction in all that relates to working up a likeness in oils. A good bromide enlargement of a suitable subject when colored is capable of being made into a veritable work of art if manipulated by a skilful hand. Who does not admire the beautiful lifelike effects, the charming flesh tints, and the remarkable resemblance to the original which can be produced on the matt surface of an enlarged portrait, which lends itself so admirably to this purpose? In working upon the photographic basis, it is possible to obtain, with comparatively few colors, wonderful results in all variety of flesh tints, and by this method all the half-tones and pearly grays which are so essential to a well-finished portrait can easily be obtained. It is not a matter of creating a likeness with which we have to contend, but the more pleasant and far less difficult one of so placing the colors as to avoid losing any of the photographic expression. With ordinary care and practice this can in time be accomplished.

In offering the following hints, therefore, on how to finish photographic portraits in oils, I do so, feeling assured that with patience and perseverance any one with a taste for painting may attain a fair amount of success if my instructions are carefully carried out. I shall endeavor to place before my readers in as simple and concise a manner as possible the method of coloring I have adopted with great success during the twenty years I have been artist to the photographic profession. I think I may claim my system of coloring to be entirely original. I do not

know that I follow the style adopted by the profession generally. For instance, the usual way with most photo colorists is to fill in the background first, then the drapery, after this the accessories, and finally the flesh. I reverse this order; in fact, there is a considerable difference in working up the enlargement in every way, as will be seen later on. All I purpose to do, however, is to state my plan and leave it to the discretion of the student to follow his own course of treatment when qualified to judge, as one naturally gets into a style which best suits one's taste and convenience.

To be really successful as a photo-painter, one or two things are essential, which are good sight, a steady hand, a taste for the work, and perseverance. All the better if my reader has had some experience in portrait photography, however slight, and especially what relates to character and expression in the picture of a face. It does not follow that an insight to photography is really necessary, as much is learned when operating with the colors; in fact, success can only be attained after many failures. A good plan is to take note of the modelling, light and shade, and other points of any good photograph that you may have in your possession, and if you do this, and follow carefully all the hints herein given, I think you will be amply repaid by eventually being successful in finishing a photo-enlargement in oils.

The requisites for a start are few and inexpensive. It is not essential to have an elaborate outfit, as many would imagine. The following will suffice, and may be obtained from any artists' colorman: A good, firm easel, full length; a strong palette, not too large—I prefer a small one, which allows you to get near your picture without danger of touching it, as occasionally you may need to rest your left hand on the easel-peg for steadiness in preference to using a maul-stick, which many painters do.

You will also require palette knife, drawing board, a bottle of linseed oil, one of turpentine, and a piece of clean linen. With respect to brushes, I use the softer kind mostly, with one or two hog-hair for special purposes. There are now brushes on the market which very much resemble sable at about half the cost. They are Siberian ox-hair, and are not only very pliable but durable, and with these one can execute fine work and preserve the likeness better than when using hog-hair entirely. You might get three soft brushes, say, Nos. 4, 5, 6, and the same sizes in hog-hair, with a larger one which you will require for backgrounds. Either round or flat hair will do; I prefer the latter. You can allow your brushes to remain in linseed oil after use, or clean all paint off with turpentine. I wash mine well in hot water, using plenty of soap; they are then nice and clean when required for use again.

I may here state that it is well to clean all paint off the palette every time it has been in use, for the paint soon sets and there is nothing which irritates one more (when painting) than having everything dirty. You will find that not only your palette and brushes, but your hands also, will be liable to get soiled unless you exercise great care.

Now, with respect to colors. Any maker's will do; and you might get the following single tubes: Flake white, Naples yellow, light red, brown madder, Indian red, raw umber, bitumen, terre-verte, burnt umber, lampblack, cobalt blue, crimson lake, Payne's gray, yellow ochre, Prussian blue, emerald green, light chrome, and megilp. It is not necessary to work with all the above at the same time, but with them you can get almost any effect desired. When using the colors for flesh tints the first twelve must be placed around the palette in the order given, with flake white to the right, and each color about an inch apart. The megilp, which is used as a medium, should be in the center of the palette. Guard against putting too much paint on the palette at one time; for painting flesh

there is no need for more than a very slight portion of each color.

Enlargements are produced by many different processes from the negative, and can be obtained from any photo-enlarger. For painting upon there is nothing so serviceable as a good bromide. The paper adapts itself well to the colors; it needs no preparation, as the gelatin surface prevents the oils from drying in. In the case of some papers it is essential to give them a coat of weak gelatin solution so that the oils will stand. It is a good plan for beginners to cut out likely subjects from the illustrated magazines, etc., which will answer all requirements if mounted on cardboard and properly sized. Of course two pictures of the same person would be needful, one of which will be needed as a guide. The larger the features the better, as you can then see all the detail clearly. Whether a paper cutting of some person or bromide enlargement, choose a portrait with plenty of character in the face. The high-lights should be nearly white, then half-tones, and deep, clear shadows. Let the lines be well defined, an elderly person by preference.

An advantage with bromides is that it is possible, after once having painted the face, to clean colors off again while the paint is wet by using a clean cloth and a little turpentine. You can then repeat your coloring operations and so gain practice. In doing this, note all defects, and try to improve upon them. With care there is no reason why you should not utilize one enlargement time after time.

Before you proceed to color the portrait, tack the enlargement, which should be mounted, on to a board in order to keep it firm. You then apply linseed oil over the part you intent to paint—the face, for instance. Wipe off the oil with a piece of clean linen, being very careful not to leave any fiber from the cloth. This is done to make the colors work smoothly. Besides it is useful in bringing detail out of the enlargement, as will be seen. Your picture is now ready for the first application of color. I presume you have placed your subject on the

easel in such a way that you can get at it without difficulty. I always stand to paint, as it affords more freedom of action. Hold your palette in the left hand, along with brushes and the small print which you will require as guide. A few soft brushes are all that is necessary at this stage. Now, having your colors nicely arranged, place some megilp in the center of the palette, then dip one of your brushes into this medium and thoroughly saturate it so that it comes to a point, when you may take any surplus megilp off by playing it a few times on the palette. Now take a small portion of light red and place it to the left, about two inches from cobalt blue; take a touch of blue and mix well with thered until you obtain a brownish mixture. Keep this well diluted with megilp. You can cool it by adding more blue, or warm it with red, and as you proceed with the painting it may be necessary for you occasionally to alter the tone. Some artists line in with burnt umber and Indian red (well blended).

Assuming then that you have got the blue and red properly mixed, you may now work on the enlargement as follows: With your brush sparingly charged with color, carefully go over all the lines and shadows of the face, mostly the lines. Put in the deepest shades first, under the chin, for instance, between the eyelids, down the shaded side of the face, the division of the lips, nostrils, etc. You might only just streak a few light warm touches down the side of the nose, the light side of the face, and any other fine detail. I usually mark all the character in a face, even the wrinkles, which can be subdued or worked out altogether if necessary in finishing touches. You may warm, cool, or deepen your colors already laid on at discretion. Sometimes the mouth, nostrils, or inner part of the ears require a little warm tone, and other parts the reverse. A little practice, however, will accustom you to the desired tone, depth, etc. Always keep your color well diluted with megilp when rubbing in, especially so until experience gives you confidence. Then it will be better to stiffen your

paint up a bit, both in lining in and when you do the flesh.

Now, look carefully over what you have done and compare with the small guide in your hand. If there are any harsh places, gently soften them with the dry brush. Care must be exercised, however, lest you interfere too much with the lining-in color—for you will be able to modify sharp patches when you apply the flesh tints. Should your subject have any moustache, beard, or whiskers, it will be safer to outline them at this stage, also the eyebrows, for you will require to soften them all into your flesh colors later on. Your mixture for this purpose may be made rather cooler by the addition of a touch of raw umber, bitumen, or lampblack, as the case requires; still keep your paint well diluted with megilp, trace cautiously all the hairs, and so preserve the character and expression. You can introduce high-lights into the moustache, etc., later on by the addition of a little white to your medium. It will be better now to proceed with the face again, and go over it with flesh color, which you do as directed in the next paragraph.

Using a clean cloth, wipe off your palette the mixture you have been using for lining-in, leaving the other colors intact. Now, take a clean soft brush and charge it with megilp as before. This time get a small portion of flake white, and thoroughly mix it with a touch of Indian red and an almost imperceptible bit of Naples yellow. The tint should be rather pale; nearly white, in fact—think of a wild rose color. Apply this mixture to the high-lights of the face, beginning at the forehead, bridge of nose, cheekbones, chin, etc., or you may use your own discretion and start on any light part of the features you think best. Now gradually work down to the deeper shadows or lining-in color with your flesh mixture, slightly cooled and darkened by adding a touch of Indian red and "terre verte," and, as you work toward the lining-in colors, already laid on, carefully blend the edges on into the other. By this means you not only neutralize the pinky condition of

your flesh tints, but you will be able to get softness over all the face, and if you stipple all together you will find the enlargement shows through the paint you have applied if you have kept the latter to the proper consistency, and this knowledge will come with practice.

At this stage you may give a little florid tint to the center of cheeks with a mixture of light red, Indian red, or brown madder with your flesh paint. Then, with a clean brush, go over the lips with nothing but Indian red, very much thinned with megilp.

Leave the flesh to dry a little now and proceed to paint the hair and beard, if any, bearing in mind that they are usually darker than the moustache.

Your paint already laid on should have stiffened a little by the time you have finished the beard, etc.; your picture also should present some resemblance to the original. You may compare it with guide photo, looking it over critically and see if you have preserved the likeness intact. Some portion of the features may appear too full and others the reverse—or perhaps you have got the flesh too brown, pink, or yellow. These defects, however, can be rectified by the following method: With a small hog-hair brush (brought to a point with your flesh mixture, to which is added a little white) go over all the face again, this time in a stippling manner. Stand with all the high-lights as before, work out any imperfection you may have created, and, if your enlargement has been a suitable one, this process will gradually expose some of its most prominent characteristics and leave the deepest tones and half-tones semi-transparent, also the grays, which are so necessary for giving a life-like effect. Attention should now be centered on the face as a whole. Look over hair, beard, moustache, and eyebrows, and see that they are properly softened into the flesh. Add a few high-lights, and put some crisp touches here and there as required. You have still the eyes to cover, respecting which you will find a special note below, and, when completed, you must leave the face for

future attention and proceed to paint the drapery, the backgrounds and accessories.

Great care is required in painting the eyes, for much of the character of a face depends on how they are treated. It is necessary to give them not only life and expression, but also their natural colors. One has only to work upon a number of subjects in order to find out how nearly every one requires special attention. In coloring the eyes, therefore, you must note particularly the way in which the light falls upon them. Only continual practice, however, will give one confidence with these. Need I say that a fine, steady touch is necessary, also a fine brush? Though there is a great difference in the expression of eyes, all are painted in a similar manner, as follows:

You will notice in the ball of every eye a small black dot in the center. Paint this first with lampblack well diluted, and keep well within the circle. Whatever the color of the eyes, this black dot is always in evidence, and must be put in as described. Suppose, now your subject has brown eyes, you just paint around the ball with bitumen, and between the inner circle of black and the outer edge of ball you fill in with a glaze of bitumen combined with a touch of white, lighter or darker, as the eye appears. Now you paint the white of the eyes, which are not really white, but of a somewhat subdued tone. This can be got with white, black and a little "terre-verte." Soften the outer edges of the ball into this. It will often be seen that a mere glaze is sufficient for the whites.

All eyes are finished as thus described, and if you keep your colors thin, you will be less likely to lose the likeness. For gray eyes, just go around the ball with thin black, and inside with blue diluted. For blue eyes a mere glaze of cobalt will often suffice. Don't make a mistake and paint any part of the eyes too opaque, or they will look lifeless and heavy. One other matter which it is as well not to overlook is the little white speck seen in all eyes.

The method I adopt when painting hair is similar in all cases. I find the lining-in process useful in preserving all detail, which must not be hidden with overlapping paint. Begin, then, by putting in all the darkest shades first and keeping the lighter parts well preserved. You can go over these later by adding a little white or Naples yellow to the darker lining-in paint. The following mixtures will convey some idea how to obtain desired effects, but always remember to keep your shadows semi-transparent to prevent heaviness. We will suppose you are going to paint brown hair. A warm effect can be obtained by lining-in with raw umber mixed with a touch of black for darker parts, and afterward going over the lighter parts with a glaze of raw umber mixed with a touch of white, Naples yellow, or light red, according to the warm or cool effect desired. For very warm brown, line in with bitumen or burnt umber, and glaze the high-lights as before. Then again, if you require auburn, or ginger, you may get almost any variety of tint, lining-in with burnt umber or burnt sienna, or even with bitumen, using yellow ochre, Naples yellow, etc., for lighter parts.

Attention can now be given to your subject's drapery, and this can be proceeded with any time after you have painted the face, hair, etc. A soft brush will answer all purposes, and you may work as follows: For lining-in I find a warm color best, and most suitable for costumes of a delicate tint. A little burnt umber and white, or either raw umber and bitumen, will suffice. Keep the tint very faint and thin, and put in all the creases, filling up with a body color of the shade required, which may be cream, pale blue, green, etc., and when all the dress is rubbed in soften all the badger as before. Black material can be got with simply black for lining-in, white added for filling-in and high-lights.

Having completed the drapery, attention must now be centered on the accessories. We will presume your subject is a three-quarter or full figure, with table, chair, or curtain introduced. All you

have to do is to line-in with suitable warm color. I find nothing better than bitumen or burnt umber well diluted with megilp. Oak, mahogany, or any kind of furniture can easily be imitated if after lining-in you fill up with a semi-opaque color of the tint you require. For instance, a good oak effect can be got with bitumen and white, and mahogany with burnt sienna and touch of white, and with some practice you will be able to paint any object in a similar manner. You must always proceed with this class of work and finish while the paint is wet, otherwise you will get a muddy and dirty effect. If done with one operation, you can join the colors nicely.

In the case of curtains it will be better to soften with the badger as soon as all is covered for softness. Tables and chairs are best not softened if nicely painted. What I mean by softening is that you play the badger gently over paint which has been laid on.

Much discretion must be exercised when putting in background, as every subject ought to be studied, according to the way in which the features, etc., are lighted. In some cases there is a lack of any studied shadows, the face of the subject being flat and quite to the front. In others the face is three-quarters, with plenty of depth on one side. In the first case a plain background will suffice, in the latter more relief may be given. It very often occurs that the photographer suits the background to his studio light, and this will be a guide in many cases. You will notice photo-backgrounds are usually lighter on the shaded side of the face, and darker where the light plays on to it; so work accordingly, and vignette gradually as you recede from the face by distributing darker tints well mixed with background color. For ordinary plain grounds you may use white, "terre-verte," raw umber, and a touch of black. Add megilp at discretion, so as to make the paint flow freely. Of course, white greatly predominates in the mixture; and when you have got all covered, you must gently soften with your badger by playing it all over the surface of the paint

laid on. Some subjects require warm and others show off better with cool effects. It is a question of taste; but always contrive to work the backgrounds and drapery while the paint is wet; you can then soften all the edges nicely one into the other.

Draperies look nice when properly painted, and for children's portraits and some subjects are very appropriate. The great point is to obtain a nice cloudy and vignetted effect, and the colors must be delicate and clean. An exception is made with this class of picture by proceeding to paint backgrounds before drapery. If you did the drapery first you would be liable to dirty your sky-tints when softening with the badger: by cautiously using linseed oil instead of megilp you can get a better result. Begin then by going over the outer circle of your picture with white and a little linseed oil, or megilp mixed with the oil, to make it flow better. Paint around your picture to within a short distance from the face. Let us suppose you are painting a bust (and, I may say, it is as well to have enlargements vignetted for this class of background); paint the bottom of your picture as well as the parts referred to. Now darken your paint slightly by adding to the white a little black and "terre-verte." Keep fairly light on the dark side of the face, and work the medium up to the subject itself, gradually softening it with your brush into the white already laid on, and producing as near as you can a cloudy effect. You can now soften all with the badger, after which add just a dab of warm color over the shoulders, and soften this with the badger, also while the paint is wet. You can then proceed with drapery, as already described, only you will need to vignette the lower part of the paint into the background which you have laid on.

The drapery, accessories, and backgrounds can often be completed with the first painting, as they are secondary matters; but the face, or flesh tints, and

the likeness generally, can often be improved, by a second application of color, or, in other words, a touching-up here and there. But before this is done, the paint previously laid on must be quite dry. In coming fresh to your picture, after having laid it aside to dry for a few days, you will note any defects more clearly, and you will be able to rectify them. So at this stage compare the picture with the guide print again, and see if you have preserved all the main characteristic features. In any case, you can cautiously repaint the flesh, and so add more body color to that laid on, and give a cleaner finish to the face generally. To do this your palette must contain all flesh colors as previously described when rubbing in. The hair, beard, eyes, etc., must now be seen to, and receive their final touches. A glaze where required, a little more or less color, a few high-lights or deeper shadows. All these points, however, can be left to your own discretion, for in these finishing bits one part greatly depends on another to form a complete and harmonious whole.

You have now completed your painting entirely. The flesh, hair, drapery, background, etc., may seem to you anything but satisfactory. But do not be discouraged; try again, and again. It is only practice you require; get a fresh enlargement of another subject, and proceed from the start again. I have no doubt my method will be a help to you, and that with practice you will attain some degree of success. You will, however, gradually get into a style of your own, and thus gain confidence. I have endeavored to give you a few hints, and if I have laid some foundation upon which you can work, my object will have been accomplished. If need be that I say more, I would advise you to be quiet and alone when painting; and if you should submit your picture to criticism, do not let any remarks discourage you, but rather stimulate you to fresh efforts.—B. J.

The PHOTOGRAPHIC JOURNAL OF AMERICA

TRADE-MARK REGISTERED

A Monthly Magazine Devoted to the Science and Art of Photography.

FOUNDED, 1864, BY EDWARD L. WILSON

FRANK V. CHAMBERS, Publisher

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OURSELVES

WITH this issue of the PHOTOGRAPHIC JOURNAL OF AMERICA the magazine returns to its original home—Philadelphia—where the executive and editorial offices are now located.

When the magazine was founded in 1864 by the late Edward L. Wilson, the original offices were within a half block of its present home and where it has been printed continuously (with the exception of one year) during its fifty-six years' existence.

By reason of illness, Mr. Thomas C. Watkins has retired from the editorship. The new staff consists of men of wide photographic experience—hence the wants of the readers of the PHOTOGRAPHIC JOURNAL OF AMERICA are known and will be in competent hands.

The "oldest" photographic magazine in America hopes to be the "youngest" in the spirit of photography in the future.

FRANK V. CHAMBERS,
Publisher.

A Letter from C. L. Lewis

It will be with, I believe, a pardonable feeling of satisfaction with the year's work, that I will turn over the office of President of the Photographers' Association of America to my very worthy successor, Howard D. Beach, at the Executive Board meeting in January. While not all was accomplished this year I had hoped for, I still feel that another year will bring the full attainment of the aims and ambitions conceived during my tenure of the office of President, and that the continuing on the Board of all my associates insures the bringing to fruition the plans we together made.

When I arrived in Milwaukee, the Saturday before the opening of the Convention, and found how excellently the plans we had laid had been carried out under the competent guidance of Mr. Abel, and what a splendid exposition the manufacturers were preparing, I felt assured the Convention would be a success, and the many congratulatory letters I have subsequently received convinced me it surely was a success. To all those who through kindly thoughtfulness thus addressed the Board through me, I wish to extend my most hearty thanks. Such courtesies make the work easier and are a great source of satisfaction.

During the thirty-nine years of the history of the Association there doubtless have been many excellent Boards, but never a more harmonious or willing set of officers than that of 1920. But not to the Board alone does the success of the 1920 Convention redound, for the spirit of helpfulness, so much abroad in the land, seemed to characterize each and everyone to whom the Board turned for help. If any of the credit of the success of this Convention accrue to me personally, it is because I was fortunate in securing the right man for the place and because of the readiness with which every man came forward and did the thing he was asked to do. Should I attempt to herein mention the many who rendered valuable service upon my request, I would tax your space and the patience of your readers, therefore will confine myself to the mention of but one, Pirie MacDonald.

To comply with what I asked of him cost him greater sacrifice than men are usually willing to make, viz., the curtailing by three weeks of an European trip and a special passage from England to America. However, in response to my request which reached him in Paris, he replied in his characteristic way: "What is the use of having friends if you can't do something hard for them? One would do something easy for anybody! I'll be there."

Among the gratifying results of the work of the past year is the effecting of a more complete organization of the commercial photographers and their amalgamation with the P. A. of A. The lively interest shown by the leaders in that branch of our profession will prove, I am sure, a great asset in the further usefulness of the Association. The interest shown in the possible amalgamation of a group of states in the south-eastern district of the country is evidence of not only a desire to assist the work of the National Association, but the appreciation of the advantage to be gained by them in the holding of an amalgamated state convention in that district. The selection of Buffalo for the next Convention practically insures a good attendance of Canadians which will, I trust, result in the revival of the Canadian Association or the organization of a provincial (Ontario) Association that will amalgamate with the P. A. of A., for it should be remembered that *ours is an International Association*.

Among the unique features of the Convention was that of the Amalgamated Association Com-

petition which, while entered into by but four associations, brought out a fine collection of photographs and stimulated a friendly rivalry without any personal animosities or other disagreeable effects usually following in the wake of an individual prize contest. The merits of this plan were clearly shown, and I feel sure met with the approval of many of our more discerning members. I sincerely hope that the next Convention will find not only those Associations contesting this year, but that others will enter and try to secure the beautiful bronze statue the judges awarded to the Missouri Valley collection.

So great and valuable was the help given by such a large number of individuals that I find it impossible to convey my thanks in a personal letter to each as I would like to, therefore I hereby wish to express my appreciation and hearty thanks for the many kindnesses shown me.

Very respectfully,
C. L. LEWIS.

December 14, 1920.

Death of William H. Rau

JUST at the time when our December number was on press, we received word of the death of William H. Rau of Philadelphia on November 19, 1920, at his home, after a short illness. We had then no opportunity further than the brief announcement of the sad event.

We take occasion here to give further particulars of the eventful life of a man of the profession so widely known and esteemed.

Mr. Rau was sixty-five years of age, but still endowed with youthful energy and spirit and full of enthusiasm for everything connected with his life-work.

He began his career at the age of thirteen and even then was entrusted by his employer, Mr. William Bell, to commissions requiring exercise of ability and tact. He seemed to the manner born, and all through his active career showed that he was equal to any occasion presented—forging ahead in the van of every advance in photography, often a pioneer in some new or little tried-out scheme, until he occupied the high esteem and appreciation not only of his fellow workers in America, but established a reputation of international importance abroad.

At the age of nineteen, Mr. Rau did not hesitate to assume the responsibilities involved in the position of photographer for the United States Transit of Venus Expedition, where he assisted in the very delicate photo-astronomical work required in the observations.

This voyage gave Mr. Rau opportunity of visiting many foreign ports as well as unfrequented regions of the world. His contact, too, with men of world distinction gave him that urbanity of manner which has been his asset for success.

On his return to America, he associated with the Government Survey of the Yellowstone and Rocky Mountain regions, helping to carry this enterprise to complete success.

In 1881 he journeyed with Mr. Edward L. Wilson, the founder of the PHOTOGRAPHIC JOURNAL OF AMERICA, through Egypt, Palestine, Arabia and Arabia Petra, bringing home photographs of monuments and historical sites never before made by the camera. On this occasion he gave evidence of his characteristic nerve and vim in insisting on the superior advantages of the then but little used gelatin or dry plate. He substantiated his contention in the satisfactory result brought home, proving the practicability of the new process.

On his return in 1882, he was placed in charge of the photographic department of Mr. Wilson's business and continued with him until the *Philadelphia Photographer* was transferred to New York in 1885 when he opened business for himself, beginning in a modest way, being his own business manager as well as operator and gradually advanced without any outside financial support, until he installed one of the largest commercial photographic enterprises in America.

Mr. Rau kept in personal touch with every department of his great workshop, being conversant with the minute details, he ever had an eye single for the production of the highest grade work.

His reputation naturally attracted the attention of distinguished men of various callings and one met at his studio world explorers and distinguished men of science and letters.

We cannot go further in detail of his various appointments and his extensive operation, but must briefly mention his identification with the noted discoveries of the Lumière color work. He was one of the first in the profession to exploit the marvellous results.

The personal characteristics of Mr. Rau were most delightful.

He had the faculty of attracting and made all who came in association feel the kindly influence he diffused, and this is what makes his loss so widely felt in those social movements where he was the promotor of good fellowship.

Mr. Rau was married in 1877 to Miss Louisa E. C. Bell, the daughter of the late William Bell, his first preceptor.

Besides the widow Mr. Rau leaves two daughters, Mrs. William Haden, of Collingswood, N. J., and Mrs. Kendrick W. Smith, of Philadelphia.

A Tribute from Mr. Rau's Employees

WE, the employees of William H. Rau, feeling the great loss by his sudden death—a loss touching us so deeply, as if it were of a dear friend or brother—desire to express our sympathy with his bereaved family.

We shall ever remember Mr. Rau for the kind relations we had in the studio.

Whatever mistakes were made, whatever grievances occurred, we felt that we might go to him in confidence, that he would meet us half way in the adjustment and the remembrance of them would no longer remain with him.

This relationship created a mutual interest

and a cordial participation in all that was connected with the business.

Everyone who came in communication with him at once was attracted by his personality. It radiated itself throughout his whole establishment to such an extent that our hearts today are bowed down with sorrow that his genial presence no longer remains with us.

Our sincerest sympathy is extended to his bereaved ones in their profound loss.

FRANK WONDERLY, *Secretary*.

Death of Sir William Abney

News has just reached us of the death of Sir William deW. Abney, K.C.B., F.R.S., etc., of Folkstone, England, on December 2, aged seventy-seven years. Perhaps no other English investigator of the scientific phase of photography stands out more prominently than Sir William Abney.

He has probably done more to advance the progress of emulsion photography than any other



THE LATE WILLIAM H. RAU, PHILADELPHIA

John McIntosh, Deceased

WE greatly regret to announce the death, after a lingering illness, of John McIntosh, F.R.P.S., the secretary of The Royal Photographic Society of Great Britain, which occurred at his home in London, November 16, 1920. Mr. McIntosh was for many years connected with the Royal and its secretary. In his death the Society suffers the loss of an indefatigable and willing worker.

investigator of Europe to bring it to a practical issue.

His name is associated with all that relates to the physical phenomena of photography, and the papers published during his lifetime are very numerous. He was a member of various English and Continental Societies, and past-president and editor of the *Photographic Journal*, of the Royal Photographic Society of Great Britain, also author of numerous works relative to photography.

American Annual of Photography, 1921

THIS old photographic landmark contains many interesting and instructive articles on photographic and kindred subjects, wherein will be found something for all classes of readers. Those that will be found particularly serviceable are "Winter Work," by Paul L. Anderson; "Making Enlargements," by Harris C. Harvey; "The Photographer and Nature," by A. H. Beardsley; "Composing the Picture," by Edward R. Dickson; "A Plea for Bromoil," by William Alexander Alcock; "Using a Ray Filter for Enlarging," by John Boyd, and "Hand and Stand," by J. E. Adnams.

The usual formulæ, weights and measures, tables, a list of photographic societies, much information on dark-rooms, developers, fixing-baths, toning solutions, numerous helpful advertisements, a calendar, and several other features, all serve to make this publication a very desirable addition to one's bookshelf or studio.

The illustrations are not up to a very high standard, for the most part, and whether this is the fault of the contributing photographers or their prints, or to the selection and reproduction we cannot say. The following are the best examples: "Avarice," by Louis Astrella; "In a Land of Romance," by J. M. Whitehead; "The End of the Rainbow," by L. A. Goetz; "Lady in Furs," by Oscar Maurer; "Portrait of an Old Lady," by Guy Spencer; "Thomas Hardy," by E. D. Hoppé; "Gentle Spirit of the Stream," by Kate Smith; "On the Fringe of the Desert," by Louis J. Steele; "Portrait" by Louis Fleckenstein; "A Portrait" by Jared Gardner, and a high-key child portrait, "Majorie," by Sophie L. Lauffer.

The Haloid Company of Rochester

THE Haloid Company, Rochester, N. Y., have adopted a novel idea in their advertising for 1921, called "Milestones in the Progress of Photography." Each month some incident of historical interest in photography will be illustrated in conjunction with the Haloid products, and from the advance copy we have seen, promises to be of much interest. The first of the series is printed this month.

THE get-together spirit which emphasized the true feeling of cooperation was again in evidence on December 4 at the Annual Cabaret and Dance presented by the Social and Welfare Club of the Willoughby Co-workers.

The house of Chas. G. Willoughby, Inc., New York's most progressive photographic supply institution, boasts an organization of real honest-to-goodness members. Each considers himself and herself an actual partner in the business, because under the Willoughby profit-sharing plan the entire organization has been welded together into a happy, satisfied and efficient unit of organization strength.

It was to keep alive this spirit of friendliness and effort that the Willoughby Co-workers

presented their annual dance at the Waldorf-Astoria, New York City, at which nearly 600 persons were present. The program consisted of a variety of entertaining specialties. Supplementing this program was feast of dancing and good cheer, and it was fitting on this occasion for Mr. Chas. G. Willoughby himself to express his deep appreciation to those present for their splendid efforts in assisting in the up-building of New York's most progressing institution of its kind.

GEORGE L. BARROWS, for many years in charge of the photo-chemical department of the Berlin Aniline Works, is President of the Sagamore Chemical Company, New York, who are the American agents for the Agfa products—Rodinal, Glycin, Amidol, Ortol, Eikonogen and Blitzlicht flash powder.

ENTRY blanks are now ready for the Fifteenth Annual Exhibition of Photographs at the John Wanamaker Store, Philadelphia. Entries close on February 11, 1921. The exhibition opens on March 7. Nineteen cash prizes, totaling \$375.00, will be offered. For particulars, address Photographic Exhibition Bureau, John Wanamaker, Philadelphia.

LOUIS SUMNER BROWN, photomicrographer at the Clinico-Pathological Laboratory of the Massachusetts General Hospital, died on December 8 at the hospital after several days' illness from pneumonia and septicemia, aged sixty-one years. He had been in the employ of the hospital for more than thirty years.

GEORGE H. BOGERT, Elliott Dangerfield, Augustus Franzen and Mr. Tallman, all prominent American painters spent an evening at The Camera Club, New York, December 11, 1920, viewing the exhibit of Alexander Keighley, F.R.P.S., which they stated were a revelation to them of the progress made and possibilities of photography as a pictorial medium.

AN exhibition of fifty pictorial portraits on Artatone opened at The Camera Club, New York, December 15, 1920, and will continue until January 15, 1921, comprising the work of Mr. Karl Tausig, of New York, and embracing his salon and prize pictures.

OUR old friend *The Wellcome Photographic Exposure Record and Diary*, 1921, has just made its annual call, looking ruddy and as handsome as ever. We would like to introduce it to those who have never met it, and to recommend it as a companion full of interest.

One new feature this year is in the calculator. Instead of the designation "strong foreground" this is termed "normal subject," and "light foreground" and "very heavy foreground" are placed at $\frac{1}{4}$ and $\frac{3}{4}$ respectively, instead of being erroneously reversed as last year. We do not discover any other improvements, for it was almost perfect before.

THE STUDIO

Shutter Types

FOR convenience, we may classify shutters into two groups—"roller-blind" and "metal" respectively. These titles are not strictly correct in every case, but they are near enough for every photographer to know what is meant by them. If we prefer another system of classification we might make it thus—"focal-plane," "diaphragm," and "roller-blind at the lens" shutters. The last somewhat clumsy designation refers to the shutters which are used in front of or behind the lens on many "landscape" cameras, but which are so seldom met with on hand cameras that they form quite a class apart. It will first be well to consider here the rival claims of the "focal-plane" and the "diaphragm" types.

It must not be supposed that any satisfactory reply can be given off-hand to the question, Which is the better type of these two? The answer must depend upon the work which the shutter will be called upon to perform; and the photographer who has to make his choice must take that into consideration. Perhaps what follows may help him to come to a decision. In making the choice he is deciding the whole character of his outfit; as, generally speaking, the pattern of the camera is governed by the pattern of the shutter to be used on it. The focal plane shutter is usually an integral part of the camera; while, if the camera is not built with a focal-plane shutter, the user is almost bound to employ a diaphragm shutter.

The beginner is tempted to put the speed of a shutter in the forefront of his requirements; and when he has to choose between one which will only work up to one one-hundredth second, and another which promises, according to its graduation, to work up to one one-thousandth, the higher figure nearly always has his vote. If there were no other difference between the two patterns very little harm would be done. Failures would soon teach him that it is only for quite specialized work, or in very rare cases otherwise, that exposures even as short as one one-hundredth second need be given, or indeed can be given with complete success; while experience might also show that it does not by any means follow that a shutter marked one one-thousandth gives one one-thousandth. Assuming that he is getting a camera for what he would describe as "general photography," he may disregard all shutter graduations higher than one-fiftieth second as in the nature of luxuries, only to be thought of when other more pressing requirements are fully met.

The qualities which are of most importance for all ordinary hand camera work are—(1) Reliability for slow exposure, say one-eighth to

one twenty-fifth second; (2) uniformity of working; (3) efficiency (in its limited, technical sense), and (4) lightness of moving parts and consequent smoothness of action.

When we review these requirements we see at once that neither one type of shutter nor the other may be considered as overwhelmingly superior in the way in which it meets them. For lightness of moving parts the diaphragm shutter is easily first, but for efficiency the focal plane ought to be, and usually is, much the better. Uniformity of working depends more on the workmanship and design of the particular instrument than on its type. Reliability with slow exposures turns largely on workmanship.

It is most improbable that the focal-plane shutter would ever have come into prominence, except for very high speed work, but for the fact that it lends itself in a way no other shutter does to use in a reflex camera. The consequence of this is that those who wish to have the advantages of the reflex put up with the disadvantages such as they are, of the focal-plane shutter. They are not very serious, although they would, in our opinion, have been sufficient, otherwise, to keep the focal-plane type from coming into general use, except for very high speeds.

Bulk and weight are the fundamental objections to the focal plane. It is obvious that the shutter of this pattern must be larger than the picture. Its moving part, a little reflection will show, must be more than twice as large as the picture; in fact, for practical work it must exceed three times. The mechanism to carry and drive it is also, of necessity, larger.

Against these drawbacks we may put the fact that its design allows very high efficiency; and the control of the exposure by variation in the width of the shutter opening allows the relative length of the different exposures to be determined very accurately. It is undoubtedly harder to hold a camera steady for a slow exposure with a focal-plane shutter than with one of diaphragm type; but the fact that focal-plane cameras for slow exposures are almost invariably of the reflex form, and therefore relatively very heavy, counteracts this to some extent. Skilled hand camera workers find no real difficulty in giving exposures of a sixteenth, or even of an eighth, with a reflex, without any sign of movement. The chief objection of the pattern for such work is that the driving spring for a long exposure is used at its weakest, and the speed, unless the shutter is very well made, is apt to be erratic; for the slowest speeds one may even find that the blind has not entirely closed.

These are criticisms of workmanship rather than of faults inherent in the design; but they tell in favor of the diaphragm shutter. The ideal instrument of this latter pattern is still

to be realized. It should open to an aperture very decidedly larger than the largest aperture of the iris; as this ensures high efficiency with large apertures, which is the point in which diaphragm shutters are most often open to criticism. The control must be pneumatic, of course, and it should give exposure of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ and $\frac{1}{16}$, with an error of not more than 10 per cent, either way. It should be practically air-tight and dust-proof; and should be constructed on so rigid a body as to provide as stiff a lens-mount as a simple tube will furnish. This is an important point when the shutter is to have a high-class anastigmat built into it.

It is evident that a shutter of this kind cannot be a very cheap one; at least, if it is to be of the iris type, which with many cameras is almost a necessity. For economical construction, the form in which the shutter consists of a single perforated metal plate sliding across the lens has much to commend it; and, indeed, some of the quite low-priced cameras fitted with this kind of exposure device are remarkably efficient. But it necessitates the shutter forming part of the camera front itself; and this is not always possible. It also makes any change from one lens to another impossible, unless the whole front is detachable. However, these are not objections to which the average hand camera user need attach very much weight.

Nothing has been written so far concerning the roller blind shutter used at the lens itself. This arrangement, although not now employed to any extent in hand camera design, is a very efficient one for the stand camera worker, who wishes to have a shutter either readily detachable or one which is most often used as a substitute for the lens cap for time exposures. It is simple, not likely to get out of order, and can be made cheaply; and we have no doubt will long be employed for its own special purpose.—*Photography.*

Photographic Pictures

THE work of copying pictures seems to present many difficulties to the ordinary photographer, judging by the examples one often sees, and we suppose to the average photographer it is work that does not often come his way, and therefore he is unprepared and has no plates or screens suitable for it. But in many cases it would pay him to keep a small stock of panchromatic plates and a yellow screen, and then he need not be afraid to tackle a copy, which would be impossible to do properly on an ordinary, or even an orthochromatic, plate.

He had better get rid, at the start, of the idea that a good copy of a picture in brilliant color can be obtained on anything but a panchromatic plate. Some people will tell you that just as good results can be obtained on "ortho" plates, which can be used in the ordinary red light of the dark-room. But if they would only think for a moment they would see that a plate which is so insensitive to red as to be safe in the ordinary dark-room is no use when one wants to

photograph a picture of, say, a cardinal in a scarlet robe, or even a view of a garden full of brilliant flowers. For such work a panchromatic plate is absolutely necessary, and also a yellow screen, or, more correctly, a "light-filter," adjusted to the color-sensitiveness of the plate. It is no use thinking that any bit of yellow glass will do, or that a screen sent out by the maker of one plate will do just as well for any other plate. The plate and the screen must be made to fit one another, if a correct result is to be obtained, and even with the most perfectly adjusted plates and screens the result is often only a compromise with difficult subjects. Occasionally one has to photograph a picture which has no light and shade, such as are sometimes used for altarpieces; all is brilliant color without shadows, and the reds and blues are of the same luminosity, and therefore photograph the same depth. In such a case it would be best perhaps to use a deeper screen than would be quite correct, and make the blues a little too dark and the reds too light.

The development of panchromatic plates should not present any great difficulty if the photographer would only make a few experiments in exposure and development. We are not sure that development in total darkness would not get rid of some of the difficulties of development. Some years ago we made the acquaintance of a clever amateur photographer, who began by using panchromatic plates at the very beginning of his photographic career. He had been on an Alpine holiday, and he showed us a set of some of the most perfect negatives we had ever seen. But the very difficulties of panchromatic plates had contributed to his success, for he had used an exposure meter for practically all his exposures, interior or exterior, landscape and snow scene, and then, when he got home, developed in tanks, in total darkness, by time—and the results were superb. We always develop panchromatic plates in total darkness, even if a "safe" light is permissible for a safe light is so dim that it is very little use. To secure even results one must have correct exposure, a standard developer, and a standard time, based on the time of development, marked on the card given with each box of plates.

The exposure should be full, especially if the picture is dark, and some old pictures need a very full exposure. An underexposed copy of a picture is useless. The negative of a good copy of a dark old master, after fixation and lying in a white dish, should appear black all over, and when held up to the light should show detail, even in the darkest parts; in such shadows the texture of the paint and canvas should show quite plainly. An exposure meter is *absolutely* necessary, especially when working away from home. The only exception to this is when making copies of small advertisements for colored lantern slides, which are done in the "copying corner," where we have a board fixed up for the purpose; it will slide up and down or sideways for centering, and the camera is fixed on a small platform running on light battens, so that it is

always square with the original. This is illuminated by four 50 c.c. electric lamps arranged on a frame, through which the lens is pointed. This arrangement is, of course, just as good for copying any print, whether colored or not; but for colored originals panchromatic plates are used, and no light-filter is necessary, as the light is sufficiently yellow. Nor is an exposure meter test necessary; in fact, it would be useless, as it would indicate exposures which would be far too long. We find that when reducing small posters, about eighteen inches square, to lantern slide size, an exposure of thirty seconds is correct at $f/32$. A test with the meter would indicate, probably, an exposure of five minutes. And a yellow screen would greatly over-correct, giving the blues too dark and the reds and yellows too light.

For daylight, it is necessary to use a light-filter and to test the power of the light with a meter. If a number of copies are being made it is scarcely necessary to use a meter for every one. Some years ago we had to make copies of fifty old pictures at Oxford, on three separate occasions, and managed to get through them in four and a half days; but it was hard work. Panchromatic plates were not invented then, and the best color-sensitive one was known as the "Spectrum." The exposures averaged about twenty minutes. We used two cameras, and while one plate was being exposed had just time to focus up the other. Fortunately it was possible to work by the light of a large, very tall, north window, so the light was very uniform. We started at eight o'clock in the morning and always made a meter test at the beginning, then another about ten o'clock, and again at twelve, and so on to six o'clock, when the light was too slow for work.

This way of working is quite safe when one is in full swing, but as many of us only do such work occasionally it is best to use the meter for all. In making copies of pictures lately it was found that when using the Ilford Panchromatic plate, with a two and half times light-filter, the exposure is complete when the paper in a Watkins meter exactly matches the guide tint, using $f/32$ for a dark picture and $f/45$ for a light one. Slight variations may be made according to the character of the picture. The meter should be hung up, not laid flat, as the light should fall on it at the same angle as upon the picture; it should be set going when the cap is removed, and when the two tints match, the cap should be replaced.

If many pictures have to be copied it is worth while making some arrangement for the camera to be mounted on, so that it can be pushed nearer or drawn away from the original, as it is often very difficult to keep the lens exactly at right angles to the center of the picture if an ordinary stand is used, especially when using a 12 x 10 camera on a folding tripod stand, on a slippery floor.

When working away from home in an ordinary house one must put up with such inconveniences. It is a good plan, when setting up the camera, to place it as near as can be judged opposite the

center of the picture, and see if the image is of the right size on the ground glass; of course, it never is at first, and the camera has to be moved backward and forward until the right position is found roughly. Then remove the focussing cloth, and standing some distance behind the camera close one eye and see if the top edge of the camera back is parallel with the top edge of the picture, if not, alter the positions of the camera until it is. Then do the same with each side of the camera; the image should then be fairly square on the screen, and the final focussing can be done. With some old dark pictures it is often difficult to find anything to focus on, but a few pieces of white paper may be moistened with the tongue and put in various parts to focus upon; if the paper has printing or writing upon it focussing is made easier. But, of course, this method must not be tried on a water-color drawing or a pastel; it can do no harm to an oil picture.

When copying pictures in private houses it is often very difficult to find a suitable place to do the work. Often the worst place of all is out of doors, for several reasons. It isn't safe, to begin with, as a storm of rain may come on, or a gust of wind may blow the picture over, or wobble the canvas during exposure, and if the picture is highly varnished it is almost impossible to avoid "glitter," and probably the color correction is not so good. A conservatory is good, but there may be difficulty with glitter, especially at the top of the picture. This may be sometimes avoided by tilting the picture forward, but then the camera must be tilted up at the same angle. The easiest light to manage is a side light from a large tall window; there is then no trouble with reflections in the varnish, unless there are white objects behind the camera. These should be removed or covered up. It is possible to copy even large pictures without removing the glass with a side light, but any light colored objects that reflect must be removed or covered up with something dark. The camera and stand can be covered with the focusing cloth and the lens with one of the black cloth bags used to protect the slides. When going out to photograph pictures it is well to put in a spare focusing cloth; it will be often found useful for covering objects that are likely to be reflected. It is not easy to tell whether a picture is going to show "glitter" in the varnish, so it is advisable, after roughly focussing it, to examine the picture for it by putting the head just in front of the lens.

Wherever it is possible to do so valuable pictures should be copied without removing the glass, as there is always an element of risk in doing it, and when dealing with pictures worth \$250,000, or more, it is best to avoid all the risks one can. Owners are naturally unwilling to allow their treasures to be handled more than is necessary.

Further notes on the difficulties which have occasionally to be surmounted, and on the development and preparation of the plates for printing, must be deferred until a succeeding issue.—*B. J. of P.*

Change Your Backgrounds

SOME photographers cling religiously to their old backgrounds. They hang on to them year after year; they keep them in use, in fact, until the scenes become a sort of trademark on their photographs. Their studios become known by their backgrounds. When a customer shows her photograph to a friend, the friend at once remarks: "Taken at So-and-so's. I see he's still planting everybody in front of that old birch tree with the thunder-cloud behind it."

Now a good background is always a good background, unless it happens to get damaged. A setting that was pictorially pleasing five years ago is no less pleasing today. The point to be remembered, nevertheless, is that the public constantly demand something new, and however successful a background may have been in its early days, it does not pay to keep it going until it has become stale in the eyes of your customers. It stamps your studio and your business methods as being hopelessly out of date; and your competitor, who comes along with new attractive scenery, will gradually draw your customers to his establishment.

Get rid of your old backgrounds. If you cannot sell or exchange them, try using them as a fabric for covering the walls of your studio or reception-room enameling them and putting them up with paneling strips to hide the joints.

The cost of clearing out or selling old backgrounds and replacing them by a few really good and up-to-date ones is insignificant when stimulating effect it has upon your business is considered. This stimulating effect is felt not only by your customers, but by yourself, your operator, and everybody through whose hands your photographs have to pass. A new setting suggests new poses and new lightings and keeps alive the desire for new ideas and freshness in your work.—*Professional Photo.*

The People You Photograph

VERY little experience in the studio is needed to teach the observant photographer how to avoid giving prominence to such facial defects as crooked noses, squinting eyes and protruding moles. Few sitters are entirely free from defects. In nearly every case the photographer will notice some feature that is not quite as it should be, or see some skin-marking that detracts from the beauty of the face. These drawbacks are met with in all types. The photographer is often compelled to use a pose and a lighting which he knows are unsuited to the type, but which are the only ones possible to hide some little defect. Furthermore, a sitter may be of a type best suited for a profile or a three-quarter face picture, but her eyes may be so full of expression that it will be better to make the most of them, even if the pose is not the best for the other features. No definite and unalterable laws can be made that will apply to every sitter.

Some sitters are very disappointing. For instance, there is the woman who comes into the studio all smiles. Her features are not

classical; but her happy, lively expression gives her a charm which makes up for any imperfection in the outline of her face. She is dressed with perfect taste, and, while she chats with you, you feel sure that you will get some really happy-looking pictures—especially when the pose and style is left entirely to you.

Once she gets in front of the camera, however, she is not the same woman. She becomes serious and self-conscious, and all the animation goes from her face. You then realize that her principal charm has gone, and that, unless you can call back the liveliness into her expression, your pictures will be useless. What are you going to do with a sitter of this type?

Expression is everything. You must be prepared to sacrifice much that you would like in posing and lighting for the sake of expression. A cold, lifeless map of this woman's face, however cleverly the head might be posed and lighted, would not be a portrait. She is a tantalizing sitter, and you must use your tact and patience, a great deal more than your knowledge of light and shade, to get a satisfactory picture of her.

Do not waste plates at the beginning of the sitting—make some exposures, but let them be "mahogany types." You will find that after a few "exposures" the sitter gradually gets used to being photographed, and her self-consciousness grows less apparent. Aim at getting a full, or nearly full, face position. This will help you to make use of the eyes and mouth, the features upon which so much of the expression of a face depends.

The following method has often been successful. Ask the sitter to stand or sit with her body and head turned well away from the camera, but not to a profile position. Then get her to look at a book, or draw her attention to something in front of her, such as a picture on the wall. While she is in this position stand beside the camera and ask a question on some subject which you have not been talking about, and one that has no relation to photography. Most likely she will turn her head toward you before answering. This will give you a chance to expose a plate. The pose itself suggests alertness, and the new topic suddenly introduced is almost certain to give animation to the features.

There are many sitters like this—and they are the most difficult class to photograph successfully. They are charming, but when you try to define their charms you find yourself in difficulties. It may be that they are of a lively happy disposition, that their smile suggests kindness and good nature, or that their carriage is graceful and dignified—it may be one or all of these, or it may be something more subtle and elusive than any of them. If the charms are difficult to define, how much more difficult must it be to reproduce them in your portraits? The more you overcome the difficulty the higher you will raise the quality of your work. The successful portrait photographer is always a keen observer of faces and a student of human character.—*Professional Photographer.*



Metol Poisoning

WE are indebted to the service department of the Ansco Company for the following compilation of formulæ regarding metol (monometholparamidophenol sulphate) poisoning. No guarantees are offered that they will effect cures in your individual cases, but they have helped others and they may do the same for you.

Metol Skin Affection. One authority includes, among the causes predisposing to metol skin affection (*i. e.*, causes which tend to lessen the natural oil in the skin and so permit the penetration of the metol): (1) Prolonged soaking in the developer; (2) the excessive use of alkaline or mercurial solutions; (3) the use of hard water and alkaline soaps; (4) the thinning and drying of the skin which occurs after middle life; (5) the abuse of stimulants, which dilate the blood-vessels of the skin and irritate the nerve-endings.

When using metol, the fingers must be protected with finger-stalls of rubber, and the whole hand frequently rinsed under the tap during the operation of developing. Should the characteristic itching indicate that an attack has commenced, the hand should be soaked in warm water for five minutes, carefully dried with a soft towel, and then well rubbed with lanoline, or any other ointment of a non-irritating character. Dry skin should not be scratched nor peeled off, but be removed with pumice stone. Any fissures which may appear from cracking of the dry skin should be painted with collodion, taking care to get the paint well down into the sore.

Metol Poisoning. Dr. N. T. Beers, as the result of treating a number of cases of metol skin poisoning, states that there is no evidence that metol is absorbed into the general circulation. It is limited to parts of the body coming in contact with the solution. Cases of sores arising in other parts of the body proved to be caused by other disease mistaken for the metol poisoning. Of preventives, the best for the skin is a saturated solution of paraffin in benzine, in which the fingers are dipped before handling the metol in any form. The less severe form of metol skin disease is best treated with a soothing lotion or ointment such as:

<i>Lotion</i>	
Acid carbolic	40 gr.
Powdered calamin	60 gr.
Zinc oxide	2 dr.
Glycerin	2 dr.
Lime water	1 oz.
Rose water to make	4 oz.

The lotion may be applied during the day and a salve by night, covering the parts with a little absorbent cotton and a light bandage or glove-finger. When the disease arrives at the chronic form, where the skin peels off and a denuded area exists, the use of a soothing ointment is recommended.

<i>Salve</i>	
Acid salicylic	15 gr.
Acid boric	1 dr.
Powdered starch	2 dr.
Zinc oxide	1 dr.
Petrolatum	1 oz.

If cracks form on the finger ends or the skin remains rough and scaly, use one of the above salves at night, wash off in the morning, and after careful drying apply flexible collodion with a small camel's-hair brush. The collodion serves as a thorough protective during the day and allows one to dispense with bandages, glove-fingers, etc. At night a little ether will remove the collodion preparatory to applying the salve. Many chronic cases heal nicely under flexible collodion alone. Do not apply the collodion too thickly, lest it cracks and the cracks extend into the skin. Always wash off one layer with ether before applying in order to prevent cracking later.

Metol and the Skin. A number of remedies for the effects of metol on the hands are given in letters addressed to the Editor of the *B. J.* The following are one or two stated to have proved efficacious:

1. Soak the hands in warm water at night, rub in zinc ointment and wear a pair of gloves to keep the ointment on. Should effect a cure in two or three days. To prevent recurrence, dip the hands frequently in clean water while at work, and at night and morning and meal intervals wash well with soap and warm water.
2. The homeopathic (internal) medicine, "Graphites 30," one tablet to be taken night and morning.

3. An ointment made as follows:

Ichthylol	1 part
Resorcin	1 "
Glycerin	1 "
Zinc oxide	1 "
Paraffin ointment	6 "

—B. J.

G. C. Shepperd recommends as an effective remedy of skin poisoning by metol, or other photographic chemicals, a mixture consisting of equal parts of glycerin and spirits of camphor, to each ounce of which ten drops of carbolic acid are added. This is well rubbed into the

skin immediately after using any photographic chemical.—*Camera Craft*.

A. V. Chandler uses as a preventive of metol affecting the skin a fairly strong bath of acetic acid. Prints are passed into this bath before being fixed, remaining in it for about the time required for a dozen prints to be developed. As each print over the twelfth is developed one is removed from the acid bath to a dish of plain water, in which the whole batch of developed prints are allowed to accumulate, when they are put to wash for a few minutes and then transferred to the fixer. Treatment of the fingers in putting prints into the acid bath protects them against the action of metol. In order to prevent acid being carried back into the developer, a good size basin of water should be at hand in which to rinse the fingers before proceeding with the development of the next print. It is found that a batch of 500 prints can be handled in this way without there being signs of stains. But prints should not come in contact with the air; they should be kept well under the water until well immersed in the fixing-bath.

It has been found, in the case of a member of the *B. J.* staff, that the skin poisoning effect of metol appeared only after the use of one particular formula out of the two metol-hydroquinone formulæ he was accustomed to rely upon, and since then he has been using the other formula repeatedly without any ill effects at all up to the present time. Almost the sole difference between the formulæ is that one contains sodium carbonate as the alkali and the other the potassium carbonate, and while the former is the injurious one, the latter appears to have no effect whatever, even though his skin has by now evidently become very sensitive. It would thus seem that though the trouble is always attributed to metol, it by no means follows that metol alone is the prime cause, and possibly the collection and summation of sufficient evidence would show that the metol-soda combination is the real enemy.—*B. J.*

Various remedies or preventives of the skin affection resulting from the use of metol as a developer have been suggested. J. Middleton recommends, as a complete cure, dressing the fingers every night, after developing, with "Almora," a preparation made by the Almora Company, England.

P. R. S. has found the "Hazeline" cream of Burroughs Wellcome & Co., a complete cure.—*B. J.*

E. J. Davison has found that Resinol salve is a cure for metol skin affection.—*B. J.*

A. Bennett recommends the following as a cure: Dissolve one pennyworth sugar of lead in 10 oz. water, and wrap the affected part in clean rag soaked in this solution, keeping the bandage on all night, and repeating soaking in the solution as the bandage dries.

J. Brushwood, one of our representatives, recommends to users of the metol developer for "Cyko" paper, a formula containing carbonate of potash in place of soda carbonate. This difference (as noted in *British Journal*

Almanac, 1914, p. 625) has the effect in some cases of avoiding the injurious effects of metol.

Water	80 oz.
Metol	90 gr.
Soda sulphite (crystals)	3½ oz.
Hydroquinone	130 gr.
Potassium carbonate (pure)	1½ oz.
Bromide of potassium	220 gr.

Alva May gives the following lotion for use in cases of skin poisoning by metol:

Acetic acid, No. 8	1 oz.
Water	2 oz.
Sodium chloride (common salt)	1 tbs.

Use this four or five times a day for several minutes at a time, rubbing it well into the skin.

—*Camera Craft*.

E. A. Freeman recommends the following procedure, which has been found an effective preventive of metol sores in regular work: On a lighted gas-ring place a bowl containing a quart of cold water; add to this 2 drops of pure carbolic acid. Immerse the hands until the heat becomes too great; then wash thoroughly with carbolic soap and dry well. If this is followed each evening after development, metol sores will trouble no more.—*B. J.*

Another remedy for metol poisoning is that recommended by C. R. Lowe, namely, permanganate of potash rubbed into the skin, followed up by cleaning with oxalic acid, as for the removal of pyro stains from the fingers.

Underexposure in Winter

DON'T stop taking pictures when the dull days come. There is no such thing as a day too dark to take pictures, and picture-taking during the gray months is a very pleasant diversion.

Many amateurs at the present time are very disappointed with their results, and the cause of their failures, briefly stated, is underexposure. But we hear it said, "Today was really bright and the sun was shining." Yes, but it must be remembered that every light that appears bright to the eye is not bright photographically. You may read easily under a strong red or yellow light, but these rays have no effect upon the sensitized photographic plate or paper. The blue and violet rays in the spectrum produce the photographic image. The sun's rays strike the earth's atmosphere almost perpendicularly in summer, but during the winter months, when the solar orb is in the north they strike our zone at a decided angle, and since the earth's atmosphere is much denser than that of the sky, these rays are deflected. In being deflected, they are divided in the spectrum; the red and yellow rays being stronger, they are deflected at a less angle than the blue and violet rays which are greatly deflected and absorbed. So we get less of the blue and violet and more red and yellow rays than in summer—a much poorer light for picture-taking, although as bright to the eye as the summer light. White light is made up of red, green and blue. Take away the blue and you get the yellow. Now a yellow light produces

less photographic intensity, but the most luminous intensity; that is, it looks by far the stronger, but has the least effect upon the photographic plate or film. Blue light has the least luminous intensity, but the greatest photographic intensity. The same condition exists at every time of the year during the early morning or evening hours. Remember these conditions and expose accordingly, and you will have a larger amount of success. Keep in mind the fact that it is not the amount of light that falls upon the object that decides the exposure but the amount of light reflected from the object to the camera; hence it is difficult to state here the correct exposure which should be given in every case. If one would use a Harvey, Bee, Wynne or Imperial exposure meter, it would be of great help, as by the use of either of these the correct exposure can be calculated. Without a meter the following will be helpful:

For very dull light give one second exposure.
Dull light, one-half second exposure.
Gray light, one-fifth second exposure.
Good light, one-twenty-fifth second exposure.
Brilliant light, one-fiftieth second exposure.
Very brilliant light, one one-hundredth second exposure. Using Stop:

U.S. 4 or $f/8$ for portraits.
U.S. 8 or $f/11$ for near views.
U.S. 16 or $f/16$ for average views.
U.S. 22 or $f/32$ for distant views.

When making any exposure over a twenty-fifth, a tripod must be used, or the camera placed on or held firmly against some object which will ensure its remaining steady during exposure—otherwise a moved picture will be the result. The shutters, without variable speeds, of the box-form roll-film and magazine plate cameras usually work at about a twenty-fifth of a second, and the stops are 11, 16 and 32.—*Harrington's*.

Labels for Bottles

A WRITER in the photographic columns of an exchange refers to the clearing up and proper arranging of the dark-room and its contents for the winter campaign. He says: "One of the most important things in this connection is properly to label bottles and trays so that each may be used for its own purpose. One of the best ways to label bottles is by grinding the surface of the glass, which can easily be done by shaking the bottle in a box containing small shot and emery powder. The best way to do this is by having a box into which you do not place the bottle, but along the top of which the bottle is laid. Wings of cloth or leather come from the side of the box in such a way as to leave an opening into which the bottle fits, so that the wings prevent the shot and emery powder from flying out of the box. Of course, the whole of the bottle which is exposed to the shot and powder will be etched, therefore that part which fits into the box should be covered with paper pasted on it and allowed to dry, leaving space for the label mark to be etched. Paper letters may be cut out and stuck in the label space, with the result that the label will soon show an etched ground sur-

rounded by the clear glass of the bottle, and with the letters of the title also in clear glass. This can only be done easily in the case of short names, such as pyro, alum, hypo, etc. In other cases the name can be written with black varnish on the ground glass label."

Fixing-bath Spots

A FORM of yellowish spots in some negatives which a correspondent sends us is perhaps a cause of mystification also to others. The spots are darkish yellow in color and of about the size and shape of the clear spots generally recognized as due to air-bells on the plate during development. They have, in fact, an origin closely akin to these latter, being due to air-bells clinging to the plate while in the fixing-bath. The action of the latter is thus impeded, with the result that the plate is only partially fixed in these minute places, and the tiny discs of partly-fixed emulsion subsequently darken. Apparently, the physical surface-texture of some plates favors adherence of air-bells more than does that of others—one notices that one brand of emulsion film feels rougher to the touch than another—but the occurrence of spots of this kind may be taken as a warning that the allowance of time in the fixing-bath is being unduly curtailed, or, alternatively, that there is not the provision in the dark-room of a bright diffused white light against which negatives can be examined before being passed to the washing tanks. If such a rapid test were made the rule, spots of this kind could not escape notice. The possibility is one more argument in favor of a white light in the dark-room—for use when required and in the proper place for it, namely, directly over the fixing sink.—*B. J.*

The Effect of Carbon Tetrachloride on Motion-Picture Film

A SERIES of tests made at the Research Laboratory of the Eastman Kodak Company has shown that commercial carbon tetrachloride, if left in contact with motion-picture film, will attack the image, especially in the presence of moisture, and bleach it out to a faint yellowish-white image.

This corrosive action of the tetrachloride is probably due to traces of sulphur chloride, formed as a by-product in the manufacture of tetrachloride by the action of chlorine on carbon bisulphide. On exposure to the air in the presence of moisture, the sulphur chloride deposits sulphur which combines with the silver image to form a faint yellow image of silver sulphide. An image faded by tetrachloride gives all the chemical tests for silver sulphide.

To confirm this theory of the action of tetrachloride on film, 1 part of sulphur chloride was added to 1000 parts of moist carbon tetrachloride and a strip of dry motion-picture film immersed in the solution. After twenty-four hours the high-lights had faded to a pale yellow, and in three days the image was bleached out entirely.

To produce any marked effect with commercially pure tetrachloride, prolonged contact for a month or more is necessary, depending on the purity of the sample, so that usually no trouble will be experienced if the solvent is allowed to thoroughly evaporate from the film before rewinding. To insure this the film should be wound spirally on a large wooden drum covered with cloth, and the cleaning liquid applied with a soft cloth or piece of velvet. The solvent has then sufficient time to thoroughly evaporate before rewinding.

If the film is cleaned on the rewinder by allowing it to pass through a cloth moistened with tetrachloride, the solvent has not time to evaporate before the film is rewound on the reel. The result is that a certain amount of the solvent is held between the folds of film and, on storing, this attacks the film image, producing a patchy, faded-out effect.

Solvents which do not attack film are gasoline, benzene, toluene and xylene, though they are inflammable. The solvent tetrachlorethylene* is non-inflammable and can be recommended for film cleaning. This substance does not attack the film and is sufficiently non-volatile to remain on the film for a short time before evaporating, and so has a chance to dissolve out the grease from the film before it is wiped off.

The precautions above for cleaning on a large drum should also be observed with this solvent.

Direct Printing upon Porcelain for Miniatures and by Transfer

THE production of miniature portraits upon thin porcelain or opal glass, to be used as a plain photograph or colored, may be made either by direct printing from a negative upon the porcelain or by printing the image upon a specially prepared paper whereby the film containing the image may be removed from the paper and placed upon the porcelain. The writer has worked practically with both the above processes in a commercial way. The two processes employed will be described in this article.

In the first place a number of sheets of thin opal glass must be procured. Any size will do, because certain size ovals or circular pieces may be cut therefrom previous to their being coated with a sensitive material, or the pieces of glass may be coated first, then small square or rectangular pieces cut therefrom, and the print made upon these, then cut and trimmed to the right shape and size, after the portrait has been made and finished. The opal glass must in the first place be made perfectly clean and stood aside away from dust, ready for use when the time comes for coating with the sensitive emulsion.

Cleaning the Porcelain

Take all the plates, brush off the dust or dirt, and wipe with a piece of clean rag. Make a mixture of soda and water by placing a large

handful of common washing soda into half a gallon of hot water. Stir this until the soda has become dissolved, then place the plates into this hot mixture. Make a small mop by tying a piece of clean rag upon a stick, then take the plates separately and rub the mop well all over both surfaces. This will saponify any greasy matter that was upon these surfaces caused by the handling. Treat each plate alike, rinse it under the faucet, then drop it into a tray containing an acid water made by mixing 1 ounce of hydrochloric acid with 20 of water. As soon as all the plates have been thus treated, remove them singly, rinse well in a stream of water, and place them in a clean rack to dry. Some of the opal glass should be finely ground upon one side, and the rest left with its natural glossy surface, because both kinds are used for miniature work.

Having the plates cleaned thus, the next thing to be done will be to make the emulsion, which is not expensive or tedious to make. Some extra labor is required, but the results obtained from this labor will by far more than repay those whose aim is to produce such charming and profitable work as photographic miniature.

Preparing the Emulsion

A small stoneware crock must be obtained—one that will hold 48 fluidounces. Such a crock or jar with a lid may be bought for ten cents. Wash this out well with hot water, then place in it the following ingredients:

A	
Distilled water	12½ fl. oz.
Hard gelatin	1½ oz. av.
Chloride of ammonium . .	23 gr.
Rochelle salts	30 gr.
Citric acid (crystals) . .	90 gr.

Allow this to stand for one hour to permit the gelatin to soak. Meantimes mix and heat to 120° F. the following ingredients:

B	
Distilled water	8 fl. oz.
Recrystallized nitrate of silver	150 gr.

C	
Distilled water	2 fl. oz.
Powdered potash alum (not chrome alum)	24 gr.

Now place the crock into a saucepan, half filled with hot water; bring this to a boil; stir the contents of the crock with a clean glass strip; let the contents fall in temperature to 120° F., then repair to the dark-room and pour the hot nitrate B solution into the crock under a ruby light, a little at a time; stir well, gradually adding the rest. Lastly add the hot C solution, stir well, then add half an ounce of pure grain alcohol; stir again, and stand the crock, with its cover on, in a cold place to cause the emulsion to become set. If made and allowed to stand over night the emulsion will be ready for washing in the morning.

* Manufactured and sold by the Dow Chemical Co., Midland, Mich.

Washing the Emulsion

Under the ruby light of the dark-room place the one hand into the crock and lift the semisolid mass of emulsion, which now exists in the form of a stiff jelly. Break it up into small lumps, either with the fingers or by cutting it with a bone or hard-rubber paper-knife, then place several of them in the center of a piece of stout canvas with an eighth of an inch mesh, having previously well washed the canvas in several changes of hot water, using no soap. Fill a large bowl or another similar crock with cold water, preferably ice-water; then twist the canvas tightly by holding the bulky end with the left hand, then twist with the right hand. The emulsion will fall in small shreds like boiled rice into the water. Treat all the emulsion the same; shake all the shreds of emulsion from the canvas into the crock or bowl; then fold it twice, and tie over the top of the crock so as to retain the shredded emulsion; up-end it, so that the water may run freely through the canvas. This done, turn the crock over and pour more cold water into it, *through the canvas*; allow it to soak for a few minutes, then tilt it again, so as to drain the water off; repeat this operation half a dozen times, using lastly a filling of distilled water; the last draining must be permitted to continue for half an hour. As soon as this is done, turn the crock over, remove the canvas, rinse this under the faucet, and dry for future use. The emulsion is now ready for melting and coating. Before this is done, however, a small quantity of a solution of nitrate of silver must be made, which may be called the D solution, made up of

Distilled water	2 fl. oz.
Recrystallized nitrate of silver	120 gr.

A smooth slab of slate or of marble must be laid upon a table and leveled and wiped over the surface with ice-cold water.

The emulsion in the crock may be melted (or as much of it as may be required), say, half the quantity. Place the crock into hot water, as was done in the first place, under an orange colored light, and the water brought to a boil. As soon as the emulsion is melted, add to the full quantity 2 ounces of pure alcohol, stir this well, then add $\frac{1}{2}$ ounce of the D solution, stirring well at the same time. The emulsion must now be filtered, which is accomplished by employing a clean kerosene lamp glass or chimney with a plain top (not the ornamental kind). Tie over this a four-fold thickness of washed cheesecloth; trim off the loose ends with a pair of scissors and pack inside a moderate size lump of absorbent cotton, fairly tight. Insert this into the ring of a retort stand, or cut a hole in a piece of board, about 3 inches in diameter, attach the board to a shelf so that it projects, place beneath the inverted chimney a suitable size stoneware pitcher, then pour the hot emulsion into this. The filtering will be perfect for this class of work. Then fill a 4-ounce graduate with the filtered emulsion and proceed to coat each plate, which is done by pouring a pool of emulsion upon the

center, tilting the plate so that the emulsion runs to each corner, draining a small quantity off at one corner into the graduate, holding the plate so that one corner touches the graduate; this is to prevent air-bubbles forming. The plate must now be laid down upon the cold slab, and pushed with a stick to one end. Then coat another, following the same process until all are coated, when it will be found that those first coated have become set, and may be placed in a rack and closed in a suitable dark closet to become dry. Another batch of plates may be prepared in the same way, if necessary. The emulsion having been once melted should be used up. If any shreds are left in the first place, they may be kept for some time in the dark by pouring over them an ounce or two of pure alcohol. All vessels should be cleaned with hot water only, while they are wet, then rinsed in clean cold water and dried, and kept ready for future use.

Printing the Image

As soon as the plates are dry they may be packed, face to face, wrapped, and kept in boxes ready for use. Take one of the plates, cut a piece from it, place it upon a negative, and print in just the same way as for printing-out paper, the only difference being that a plate cannot be as easily examined as paper, as to the right depth required, but this difficulty can be overcome by affixing a strip of glass upon the negative or film (in the latter case the film must rest upon a clean glass plate), then attach the glass strip to the negative or the supporting glass plate by means of gummed paper strip, and attach a piece of this gum strip to the porcelain plate and the glass strip so as to form a hinge, then when the back of the frame is opened the porcelain plate may be turned back and examined. It will then fall back in its place in proper register, the exposure being continued until the printing is complete, when it may be removed and another one substituted, if desired.

Toning the Porcelain

As soon as the print or prints are made they may be kept for a day or two previous to toning, if necessary; the toning bath, however, must be made twenty-four hours before use. A borax-gold toning bath may be used, but the result is not equal in color and lasting quality as if the image had been toned in the acetate bath here given:

Toning Bath

Water	16 fl. oz.
Acetate of soda	60 gr.
Bicarbonate of soda	5 gr.
Terchloride of gold	2 gr.

Prepare the above and shake the mixture well. At the end of twenty-four hours it will be fit for use. Wash the exposed plate or plates in cold water for a short time; change the water until no milkiness is observed; pour the toning solution into a suitable tray; place the plates in this and rock the tray occasionally. In the course of about five minutes the change in color will be

observed; now remove them and place them into another tray of clean cold water and fix the image in a plain hyposulphite of soda solution, 2 ounces of hypo to 10 of water. The fixing of the image will be complete in ten minutes or less, when the plate must be washed in running water for half an hour, the surface must be carefully wiped with a piece of wet absorbent cotton while the water is running upon it, then placed aside to dry in a rack. If any spotting is necessary it must be done at this stage. The surface must be coated with a varnish or lacquer. The best lacquer for this class of work is amylacetate collodion, better known as banana oil. When coated with this preparation and dried the plate may be cut to shape, or if it has already been cut, it may then be fitted into its receptacle, which completes the work.

The Transfer Process

To produce porcelain miniatures by transfer, the following collodion emulsion must be made and allowed to stand for a day before use:

Collodio Chloride Emulsion

A

Soluble cotton (pyroxyline)	25 gr.
Pure alcohol	2 fl. oz.
Sulphuric ether	2 fl. oz.

B

Recrystallized nitrate of silver	120 gr.
Distilled water	1 dram
Pure alcohol	2 drams

Grind the nitrate of silver to a fine powder in a mortar, dissolve the above in a test-tube by the aid of heat.

C

Chloride of strontium	32 gr.
Pure alcohol	1 fl. oz.

D

Citric acid (crystal)	32 gr.
Pure alcohol	1 fl. oz.

Take an amber-colored bottle, pour into it 2 fluidounces of A; add to this 30 drops of B mixed with 1 dram of pure alcohol; shake this mixture well. Add 1 dram of C, a few drops at a time, shaking the bottle between each addition, and lastly add 30 drops of D. The mixture after being well shaken may now stand aside for about twelve hours, when upon filtering through a small tuft of absorbent cotton pressed, not too tightly, in the neck of a small glass funnel, covering the top with a glass plate, and performing all the operations under an orange colored light. The emulsion will now be ready for use. The filtering is best performed just previous to using. A few pieces of stripping paper must now be prepared as follows: Take several sheets of baryta coated paper, cut to 6 x 8 or 8 x 10 and float them upon the following preparation:

Gelatin (soft)	90 gr.
White granulated sugar	30 gr.
Distilled water	6 fl. oz.

The gelatin may be cut into small pieces and soaked in the water and sugar for a quarter of an hour. Place the vessel into hot water, when the gelatin will soon melt. Stir the mixture so as to insure complete incorporation; then strain this through a fourfold thickness of clean, washed cheesecloth into a tray that has been made warm by pouring warm water into it and well drained. Take a piece of the paper and lay it with care, baryta face down, upon the warm mixture; let it rest for about one minute, then lift it and, by clipping one corner with a wood clip, suspend it to dry away from dust. Any number of sheets of paper may be prepared because they will keep for years previous to use. When dry, fold the edges upward so as to form a tray, for about a quarter of an inch all round; attach this to a piece of stout cardboard at each corner by means of a light touch of sealing wax. This will keep the paper flat during the coating operation. Fold the paper at opposite corners so as to form a lip. Now under amber light pour some of the collodion emulsion into this paper tray, let it float all over and drain the excess into a second amber bottle; suspend the coated paper in the dark to dry, which in a warm room will be complete in half an hour, when it must be coated again with the emulsion and drained from the opposite corner and dried again. This second coating will produce an even surface of emulsion all over the paper.

After drying again, a second time, the paper is ready for printing the image, which is carried out in just the same way as for printing-out papers, the printing being carried a little deeper than for a finished picture. After printing, all that is necessary is to wash the print several times in cold water and tone, wash and fix the image in just the same way as for the plates.

After fixing and washing the process of transfer is made by dipping the print into warm water, when in the course of a short time the sugar gelatin base underneath the collodion film will soften and slightly dissolve. The film containing the image may now be slipped off the paper beneath the water by the aid of a camelhair or sable brush and slid upon the porcelain, there being enough of the gelatin preparation to cause it to adhere firmly to the porcelain.

The plate is now allowed to dry spontaneously (*use no heat*), and when dry it may be spotted or colored and coated with lacquer in the same way as was carried out with the printed-out porcelain plate. The collodion emulsion that is left over will remain in good working condition for some time and may be used by being shaken up and filtered. All the ingredients composing the emulsion when kept separately will keep in good condition for a year or longer, while the toning bath will produce beautiful tones after it has been used several times. It will change in color to a reddish purple. This is of no consequence; only add a little more gold to this discolored solution, when it will tone better than a new bath.

Instantaneous Development of Films and Plates

THE statement that a spool of sensitive film or dry plates exposed in the camera in the ordinary way can be fully developed in less than a quarter of a minute may possibly arouse a certain amount of disbelief. The further statement that such a period as a quarter of a minute will, under certain conditions, produce overdevelopment, and that perfect negatives equal to those secured by any other form of chemical action can be produced in *less than five seconds*, calls for immediate explanation.

It is with a certain amount of trepidation that one comes into conflict with well-established theories. In photographic procedure the comparatively prolonged action of dilute developers in the production of well-graded negatives is generally accepted as correct. It may be well, therefore, to say at the outset that, while such procedure appears to be sound in both theory and practice, the method described hereafter is, so far as the author is concerned, sound in practice only. Pressure of other work has not permitted sufficient time for the investigation of the theory. It is, however, by their practical application that most theories stand or fall. When, therefore, it is said that with this form of development—during the last six months—at first experimentally, and then with increasing wonder, and lately with full confidence, most of my own negatives have been produced, the reasonableness of the request for a hearing will not be denied.

To return, however, to the original statement. The ratios of time of first appearance of the developable image, time of complete development, and the temperature are now fairly well understood by most photographers, thanks to the preachments of Mr. Alfred Watkins. A fourth factor—the dilution of the developer—has not been taken into account to any extent, because it has been understood not to greatly affect the other ratios. So, for instance, if a certain developer with a factor of 10 gives its first appearance of image in twenty seconds at a temperature of 65° F., it will produce its fully developed negative in 200 seconds, or 3½ minutes. If the solution is diluted with an equal bulk of water, at the same temperature, it will normally give its first appearance of image in 40 seconds, and complete development will be effected in 400 seconds, or 6½ minutes, and so on.

It has not been generally realized that the converse is equally capable of practical application. If instead of diluting the developer by halving its strength it is concentrated, so that it is made double as strong, the other factors still hold good. With the developer mentioned above the image would appear in 10 seconds, and development be complete in 100 seconds. Double the strength again, and the completed negative will be finished in 50 seconds.

Here, however, the theorist will probably step in. The *reductio ad absurdum* has been anticipated. He says: "According to this principle, if the developer is sufficiently concentrated it would be possible to make the appearance of the image in $\frac{1}{100}$ of a second and complete develop-

ment in $\frac{1}{10}$ second." Exactly—and the only drawback to the consummation of this achievement is the limitations in making a sufficiently concentrated developer and its powers of penetration into the film in so brief a time.

"Granted," says our friend; "and assuming that it is possible to completely and fully develop the image in even five seconds, according to the original statement, how about the quality of the negative?" That is for each to judge. Suffice it to say that, out of many hundreds of negatives on both films and plates developed by this method during the past few months, experimentally and otherwise there is absolutely nothing in the way of gradation rendering strength of highlights, clearness of shadows, cleanness of image, and freedom from graininess and physical defects generally that would distinguish the results from technically good negatives successfully produced by any other means.

The two points demanding attention, therefore, are concentration of developer and dexterity in manipulation. Needless to say, when a roll of film or a plate is to be fully developed in, say, five seconds, the attention of the mind and fingers must also be concentrated.

It is well known that if a formula for an ordinary developing solution is taken (and there are many hundreds of them) and the quantity of solvent, *e. g.*, water, is reduced to, say, one-quarter, the chemicals will generally refuse to entirely dissolve, and some will remain in solid form in the liquid. If it is boiled they may dissolve, but on the solution cooling are again precipitated as solids. The use of a caustic alkali, *e. g.*, sodium hydrate or potassium hydrate, instead of the carbonate will, however, in many cases enable a much greater degree of concentration to be arrived at. Either of the following formulæ are typical examples of highly concentrated developers:

M. Q. CONCENTRATED DEVELOPING SOLUTION

Hot water	10 oz.
Sodium sulphite (cryst.)	4 oz.
Metol	100 gr.
Hydroquinone	200 gr.
Sodium hydrate	200 gr.

PARAMIDOPHENOL CONCENTRATED DEVELOPING SOLUTION

Hot water	10 oz.
Sodium sulphite (cryst.)	3 oz.
Hydrochlorate of paramidophenol	1 oz.
Sodium hydrate	q.s.

Add the caustic soda in strong solution until there is complete dissolving of the precipitate first formed.

Instead of these the commercial concentrated developers—Rodinal, Azol, or Certinal—can be used.

How to Use the Developer

Although it may appear a small matter to record, a certain amount of faith is necessary to follow the advice: Pour a bottleful of "neat" Rodinal on to a cherished exposure and so obtain

a perfect negative instantaneously. Yet this, in brief, is the method advocated; and the only corollary to be added is: Do not waste time in getting the negative out of the developer into the fixing-bath. Either of the formulæ given above or the commercial solutions mentioned give a sufficiently concentrated solution to produce a perfectly developed negative from a properly exposed plate or film, and, moreover, a beautifully clean negative, in less than five seconds.

Five seconds has been given as the average time in which the developer can be made to completely cover the plate, or in which a short length of film (Ensignette six-exposure, V.P.K. eight-exposure, 2½ by 3½ and quarter-plate six-exposure larger sizes double-twos) can be drawn once deliberately through the solution and back again. The avoidance of markings is purely a matter of practice and taking care to rinse the film or plate first in plain water.

As a beginning, do not use the fully concentrated solution. Be content to develop the exposure in, say, half a minute. Dilute the developer one part in six of water. First, if a spool film is being treated, run it through a dish of plain water, see-saw fashion, for a minute, until it is thoroughly wetted. Pass the fingers over the surface to remove any small air-bells. Have the developer in a deep dish, which need not be much wider than the width of the film—this for economy of the developer. Hold the end of the film between the finger and thumb of the right hand. Let the film hang straight down, and take the other end between the fingers and thumb of the left hand. Plunge the lower end into the solution and gradually draw it through and up, at the same time lowering the right hand holding the other end. Continue the action, drawing the film through the developer in a U-shaped loop, until the fingers of the right hand holding the other end of the film are in the solution and the left hand is uppermost, holding the film straight down again. This is, of course, the usual method of dealing with films which are not developed in a tank. In this case, however, the tiring monotony of see-sawing the film up and down for, say, ten minutes in a normal developer is avoided. By using the formula as given (1 in 6) the negatives will be fully developed in half a minute. Reduce the dilution to 1 in 3, and fifteen seconds will suffice.

When sufficient dexterity is gained the film can be completely submerged, passed regularly through the strong solution and back again, while slowly counting one—two—three—four. The image literally flashes out as the surface of the film comes into contact with the solution, and within the time mentioned is developed through to the back. A slight pause is, perhaps advisable as the right-hand end comes to the developer, to compensate for the double passage through the liquid of the rest of the film; otherwise, a steady, unwavering action is best. The film can then be passed straight into a strong acid fixing-bath: Hypo, 6 oz; metabisulphite of potash, ½ oz; water, 20 oz. When fixed, the film is washed and dried as usual.

It will be clear that for the worker with larger and longer spools of film the concentrated solution will have to be diluted somewhat to allow time for the actual passage of the film through the developer. The amount of dilution is, however, regulated entirely by the dexterity of the worker. If he can pass, say, a ten-exposure postcard spool into the developer (being more diluted, a larger quantity and a bigger dish can be used), unroll it under the solution from one side of the dish to the other and back again twice in one minute, the developer can be used diluted.

It should be borne in mind, however, that temperature plays an important part in this matter of speedy development. In the case of the metol-hydroquinone formula, this is specially worthy of note, as the well-known effect of low temperature on hydroquinone developer is very marked in the concentrated solution. Therefore, use all developers, especially during the winter months, at not less than 65° F. The action slows perceptibly as the temperature falls below this, a fact that may be taken advantage of to prolong the action in place of dilution, but it is doubtful whether the resulting image is as good and full of gradation as when the temperature is higher.

Advantages and Disadvantages

It may be asked at this juncture, What are the advantages of the process? Apart from the actual fact that a most remarkable saving of time is effected in development, with no falling off in quality, one has only to experience the task of dealing with a great number of small films to appreciate its value. When the amateur realizes that he can fully develop a *dozen* Ensignette, V.P.K., or other small-camera spools *in less than a quarter of an hour*, giving each individual treatment; when the trade worker, with the monotonous round of spools and plates day after day, finds that a day's development can be accomplished in an hour or two; when the Press photographer, to whom every instant is valuable, can have his fully developed negatives within a minute of rushing into the dark-room—then a few of the advantages will be seen.

For the worker who has stood for many weary hours developing films until his arms ache, and who cannot afford a series of developing tanks, the method should be hailed with delight. The only disadvantage that is likely to be set off against the advantages is the question of cost. The developer being used in an undiluted form is likely to be more wasteful, but if care is taken and the developing dish is stood inside a larger one, so that all overflow can be poured back again it is surprising how long two or three ounces of developer will last. It appears to keep better in its concentrated form, and can be used over and over again until it is the color of stout, and visibly loses its potency. A plan that has been adopted with success is to pour the used developer back into the stock-bottle for future use.

So far as our own experience goes, there appears to be little difference in the extent of the developing powers of, say, an eight-ounce bottle of rodinal when used in its concentrated form and when used diluted. In the latter form it may

make so many gallons of developer, which will develop so many films or plates. In the former condition it surprised us how many hundreds of exposures could be dealt with before the action perceptibly weakened, and even then it continued to do duty for some time, although its appearance approximated to that of ink.

Another Good Formula

Another developing formula, additional to the two given, and one that is well suited to this rapid form of development, is the following:

Hot water	10 oz.
Sulphite of soda	4 oz.
Carbonate of potash	3 oz.

When dissolved, add

Adurol	$\frac{1}{2}$ oz.
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The good points of Adurol as a developer are not fully appreciated by most photographers. The solution has extraordinarily good keeping qualities. It gives beautifully clean negatives (Adurol is also an excellent bromide and gaslight developer), and although similar in some respects to hydroquinone, has none of this chemical's disadvantages in the matter of temperature, etc. The concentrated solution given above should be used as it is, but is not quite so rapid in action as the paramidophenol formula given in the first part of this article. It, nevertheless, permits a perfectly developed negative to be obtained in a quarter of a minute. If a still greater concentration is desired with the Adurol formula, the carbonate of potash can be replaced with about 2 oz. of potassium hydrate, and the hot water reduced one-half. It should be noted when making up any of these concentrated developers that the first mixture of the chemicals with the hot water produces a pasty mass, which rapidly clears on stirring in the caustic alkali (sodium or potassium hydrate). The amount of the latter is determined by this means, as only sufficient should be added (and dissolved) to clear the solution.

Innumerable experiments, conducted with most brands on the market, have shown that the foregoing methods apply equally well to plates. The plates should also be well wetted first in plain water, the developer poured cleanly on with a single sweep, the dish rocked a couple of times, and the plates taken out at once, rinsed under running tap, and transferred straight to the acid-hypo bath.—F. J. MORTIMER, in *The Amateur Photographer*.

Compound Developers and their Effects on Gradation

PYRO-METOL and metol-hydroquinone are such popular developers at the present time that one hardly gives a thought to their composition, so natural does it seem that pyro and metol, and metol and hydroquinone, should be yoked together. But if pyro alone were perfect we should not mix metol with it, and similarly if metol were quite satisfactory we should not combine it with hydroquinone.

According to theory, any developer may be modified in constitution so as to produce any

class of negative. In his early days the photographer is taught that "more pyro gives more contrast, more soda gives less contrast," and so on. But in practice it works out that the best result is most readily obtained by hitting upon a mixture of two developing agents of widely different properties. Pyro-metol and metol-hydroquinone are merely types of a certain class of developer, and examples of an excellent system.

The artistic photographer arrives at his results not so much by following general rules as by exercising individuality in technical work as well as in choice and pictorial composition of subject. To be master of technical operations is quite essential to pictorial success, and as the gradation in the negative is of primary importance, the study of developers assumes an important aspect.

All developing agents are substances which are capable of reducing exposed silver bromide to metallic silver. The latent image is invisible and consists of exposed silver bromide, the negative image is black and consists of metallic silver. The bromide has therefore to be separated or split off from the silver bromide, and is either absorbed by the developing agent or made to decompose the water present, the liberated oxygen of which combines with and oxidizes the chemical reducer.

Now the readiness with which the developer reduces the silver bromide varies considerably with different agents; some work slowly—hydroquinone and glycin for example; others work rapidly—metol and amidol are types of "energetic" developers; so active is the latter that it does not even require an accelerator, such as carbonate. In selecting a developer, therefore, we want to have some definite idea of the relative properties of the most common agents and to prepare a formula most likely to answer a given purpose.

The object of this article is to point out the advantage of the principle of keeping separate the two developing agents, and to mix them in varying proportions according to the gradation desired in the negative.

Take the case of metol-hydroquinone as a typical example. Metol is a rapid-working developer capable of giving a very long scale of gradation, extreme softness, etc. Hydroquinone is a slow-working agent, capable of yielding great density, and a great—sometimes undesirable—amount of contrast.

Combined in the usual way we get a developer which works fairly rapidly, and gives a bright, plucky negative of the type admired chiefly by raw amateurs.

But suppose now we prepare two separate solutions, one a full-fledged metol developer which will yield intense softness, the other a hydroquinone developer which will give a harsh negative. By mixing these in varying proportion we may prepare a whole variety of developers, each one giving a different quality of gradation. The method applies equally well to plates and papers, and is indeed invaluable where we have to print on bromide paper from a varied lot of negatives.

Such a formula, in two solutions, would run as follows:

A. Metol, 18 gr.; sodium sulphite, 380 gr.; sodium carbonate, 450 gr.; water, 10 oz.

B. Hydroquinone, 70 gr.; potassium metabisulphite, 24 gr.; sodium sulphite, 200 gr.; sodium carbonate, 550 gr.; potassium bromide, 4 gr.; water, 10 oz.

Pyro-metol is deservedly popular for general work, as the density-giving powers of pyro and the crispness (when combined with the exquisite gradation-giving properties) of metol enable a thoroughly serviceable developer to be prepared. But here again we may exercise discretion as to how we proportion the pyro and the metol, bearing in mind always the characteristics of these two reducing agents. A one solution pyro developer is impossible in practice, hence in this instance the two reducers must be mixed together. By using equal parts of each we get a good all-round developer, and the following will serve as a good starting-point to experiment from:

A. Pyrogallol, 50 gr.; metol, 50 gr.; potassium metabisulphite, 120 gr.; potassium bromide, 20 gr.; water, 20 ounces.

A. Sodium carbonate, 5 oz.; water, 20 oz.

Equal parts of A and B are mixed for use.

Eikonogen and hydroquinone work very well together, as also do edinol and hydroquinone. But it would be impossible to recommend a combination to suit everybody. As, however, it is clear that advantages can be derived by suitably combining two agents of different properties as regards the scale of gradation, quality of contrasts, and so forth, the following general lines on which a good developer may be arrived at will be given in conclusion.

Any agent which we want to test can be mixed, for a start, with eight or ten times its weight of sodium sulphite and one hundred times the quantity of water; thus kachin 1 part, sulphite 8 parts, water 100 parts could form the "A" solution. A 10 per cent. solution of crystallized sodium carbonate could form "B." Equal parts of each mixed would act as a developer, and should always be first tested without the addition of bromide. A test plate can be exposed on some suitable subject, and the character of the resulting negative examined. We know (1) that by increasing the proportion of carbonate, development will be more rapid and softness greater; (2) that by increasing the proportion of reducer (metol, etc.), development will be less rapid and density greater.

As a general rule, each developer will be found to work best when it gives a certain character of negative under certain circumstances. If that character is not what we want, it can always be obtained by mixing the developer with another which modifies it in the right direction.

When a combination has been arrived at which works satisfactorily, an aggregate single formula can be prepared. But wherever possible we would emphasize the advantage of having two separate formulæ, as in the given instance of metol and hydroquinone, which can be mixed in varying proportions according as circumstances require.

Photographs for Reproduction

WHEN making a photograph to be used for reproduction or half-tone work several things should be considered.

First, we will take up the surface of the print. It is commonly known that a print having a glossy surface is the most desirable, especially if all detail is to be preserved in the reproduction. This is a fact, but a half matte or even a dead matte print will make a first-class reproduction, provided the surface of the print is smooth. The gloss or luster is not necessary, but as such surfaces are usually smooth they have grown in favor to such an extent that half-tone workers demand prints having such a surface, or they will refuse to guarantee a good half-tone plate. In this they err, but as so many dead surface prints are accompanied by more or less grain, the half-tone workers concluded that only glossy surfaces were suitable. The blame was not placed on the grain, where it belonged.

Of course, almost all photographers know better than to expect a good reproduction from a coarse-grained print, but there are still a few (and some of the better photographers, too) who seem to think that to get a really artistic reproduction the print used must be artistically printed on a rough surface paper. At any rate, they continue to send to magazine editors for reproduction beautiful specimens of their work printed on a rough paper.

It is hard to get a real artist photographer to allow a print from one of his portrait negatives to leave his hands when printed on a smooth luster paper. To his eye they look so much better printed on a paper giving a softer and more velvety effect. It is true that they are better to look at, but not better for reproduction.

Then another thing that half-tone platemakers almost insist on is a print having a reddish or brown tone. Prints having such a tone will reproduce well, but an olive-black print will reproduce fully as well.

The prejudice against black and white prints for reproduction purposes has been caused by the blue-black tone. If there is a trace of blue tone in the black print it will lose quality in reproducing, but an olive-black print will come out rich and vigorous in the reproduction, just as a red or brown print will.

This is accounted for by the actinic effect of the blue rays reflected from the blue-black print, which give false tone values during the process of making the half-tone plate.

Olive, like brown and red, is non-actinic, and therefore the tone values are faithfully reproduced from prints finished in any of these three tones.

To get a good reproduction, give the process man a smooth print, either glossy or dull, but be sure it is smooth. Also give him a print having an olive, red, or brown tone, and the reproduction will please you, if he has done his part of the work correctly.

We presume that you have put in your supply of paper, plates chemicals, etc., to carry you over to the first of the year. If not you better

had. Even prompt shipping stock houses are not responsible for shipping delays, which are very numerous along about the middle of this month when express companies are doing four or five times their normal amount of business.

If a negative is valuable, varnish it before printing.

In the first "Brevity" given last week benzola was a misprint for benzol.

Intensification stains are due to insufficient washing before or during the process.

Thio-carbamide, 1 dram; citric acid, 1 dram; water, 1½ oz., will remove dichoric fog.

If Farmer's reducer is used too strong it will cause yellow stains difficult to remove.

The ferricyanide or persulphate reducer is more under control when applied locally with a camel-hair brush if thickened with glycerine.

A Sidelight on Mercurial Intensification

THE "unearthing" a short time ago of some dozens of old negatives that had lain—unwanted, but not forgotten—in a rather damp cellar has served to throw an interesting sidelight on the premanency of some intensification methods in use during the very early part of the present century—not so very long ago, it is true, but long enough to prove that certain methods of intensification may irretrievably ruin a negative.

In those early days I had a peculiar weakness for underdeveloping negatives and intensifying them with the once-popular mercury-ammonia solutions, in spite of occasional defects such as reticulation, frilling and stains. I used the process for many years because it gave the very strong negatives I was in need of. The oldest of these mercury-ammonia negatives, I need hardly say, were found to be absolutely useless, having faded almost beyond recognition or developed the most peculiar kind of markings and spots. So bad were some of the negatives that the late Mr. A. Haddon—who was greatly interested in mercurial intensification—asked for and obtained a few of the most horrible examples for the purpose of analysis, with the object of making a report thereon, a task, alas, he was never able to perform because of death intervening. The worst specimens of fading were those negatives that were treated in the old-fashioned manner, namely, by bleaching in a solution of mercury, washing in plain water, blackening with ammonia, and finally washing well, they being treated before the advocacy of the use of weak hydrochloric acid after bleaching.

Mr. Haddon, it will be remembered, advocated the acid bath after many experiments, he analyzing the bleached image before and after the acid treatment. Negatives treated with hydrochloric acid were in a far better state of preservation than those not subjected to it, but were by no means perfect, possibly because of faulty treatment combined with improper storage, but the acid treatment is to be recommended rather than condemned. Haddon's plan of eliminating from the mercury-bleached film the last traces of a mercuric salt is to wash the bleached film for ten minutes in plain water, transfer it to a weak

hydrochloric acid bath (60 drops of acid to 10 oz. of water), in which the negative must remain for four minutes, and then rinse in water. The negative is then placed again for a like time in a weak acid bath, rinsed, and placed again in an acid bath, rinsed again and finally blackened in a diluted ammonia bath. The three separate acid baths do a lot toward ensuring permanency.

By far the best-preserved of the old intensified negatives were some I cared least about, and I well remember experimenting with them at a time the intensification fever was upon me, little caring about success with them. To my great surprise, however, they showed the least sign of deterioration. They were—in 1907—subjected to a mercury-soda sulphite treatment worked out by John Bartlett, of Philadelphia, and one strongly advocated by Dr. Charles L. Mitchell, of that city. The process did not appear to me to be a good one in theory, but knowing Dr. Mitchell, and that his knowledge of chemistry was greater than mine, I used the process, and the almost perfect state of the old negatives leads me to recall it, as it is not to be found in any books of reference.

First of all it is most important that the negative to be intensified should be thoroughly fixed, washed and *dried*. The negative is then soaked in plain water for a few minutes, carefully wiped over while in the water with cotton wool so as to remove air-bubbles, water poured off, and treated for one minute with a weak clearing or reducing bath composed of citric acid and iron perchloride (60 gr. of each) in one pint of water, and then washed for about five minutes. It cannot be said that this bath adds to the permanency of the negative; its use is to remove any veiling and to furnish a groundwork for the subsequent deposit of mercury. The use of such a bath is advisable and has been recommended for many years, for, as is well known, intensifiers intensify any fog there may be in a negative, often making the supposed remedy worse than the disease.

The bleaching solution is composed of mercury bichloride and common salt (½ oz. of each) in one pint of water, and particular care must be taken not to overwork it. It will serve for many dozens of negatives, but the fewer it is used for the better. The negative is bleached in this solution in the usual way, and then given a bath of common salt (2 oz. to the pint of water) for about a minute, and after a five minutes' wash in plain water is ready for the blackening.

The American experts claimed that this salt bath dissolved out any mercury remaining in the film, and prevented the shadow portions of the negative from becoming clogged up during the process of blackening, a statement much questioned at the time of its introduction. That a mercury-clearing bath of some kind is required for the purpose of ensuring permanency all will admit, but the hydrochloric acid treatment appears—in theory, at any rate—to be the better one. I am inclined to think that the secret of the best-preserved negatives is the use of a sulphite blackener rather than a salt bath.

The blackener the process calls for is made up

as per the following formula: Soda sulphite crystals, 3 oz.; strongest sulphuric acid, $\frac{1}{4}$ oz.; water, 16 oz. The soda is dissolved in 12 oz. of warm water, allowed to cool, and then the acid, previously mixed with 4 oz. of water, added. Readers may be reminded that the way to mix sulphuric acid with water is to add the acid in very small quantities, not water to acid, as in the latter case, owing to the violence and heat of the combination, the receptacle may crack or the acid be thrown into the face of the worker.

This soda blackener acts as the ammonia solution does, first browning and then blackening the bleached image, the image being, perhaps, more bluish-black than real black. The negative is finally washed and swabbed with cotton-wool, a ten minutes' washing being sufficient, and then dried as usual.

It may be said that there is little difference between the above method and the mercury method commonly—or once commonly—employed, but what difference there is, I think, may be important, and make all the difference between impermanence and permanence, as I cannot believe that the more or less perfect state of my unearthed negatives intensified by the process is the result of chance, or of being washed more than those intensified with mercury and ammonia.

The mercury processes of intensification are not likely to be used very largely now that the chromium method has come forward, but there are still some workers who prefer mercury for some kinds of negatives, and the results of my "discovery" may be of some interest, if not of real service.—L. T. Woods, in *B. J.*

Enlarged Negatives

ALTHOUGH the general adoption of bromide paper for enlarging has greatly reduced the necessity for enlarged negatives, there are still many occasions on which they are indispensable, all processes of contact printing, such as carbon, platinum, P. O. P., or oil printing, being only possible from a full-sized negative. Even for bromide or gaslight prints in quantities the enlarged negative may facilitate production when compared with the operation of enlarging direct from the original small plate, and there is the further advantage that a considerable improvement in quality both by means of judicious exposure and development of both the transparency and negative may be made, as well as the possibility of working up by hand if the original needs it.

As is generally known, the first step is to make a transparency from the original negative, and this may be done either by contact or in the enlarging camera to the necessary size. The former is the easier and cheaper, but the latter gives the best results. As the procedure is nearly the same in both cases, we will deal with the small transparency method first. Having carefully cleaned and, if necessary, spotted the negative, it is placed in a printing frame, and a slow fine grain plate placed in contact with it, film to film, the greatest care being taken to remove all particles of dust, which would cause small trans-

parent spots in the positive and large opaque ones in the finished negative, the latter being difficult to remove. As most plates are slightly concave upon the coated side, it is advisable to expose to a small source of light at a distance of several feet and to keep the frame quite still to avoid diffusion by parallax. The exposure should be on the full side and development carried on until the density is that of a rather thin negative. There should be no clear glass, or the enlargement will probably be too hard. Lantern slide quality is not the best for enlarging from. It is obvious that at this stage considerable modification of the character of the image is possible. By suitable exposure and development a soft thin transparency may be made from a hard, dense negative, or a vigorous one from a thin negative. Intensification or reduction may be used if needed, and after drying and careful spotting the transparency is ready for enlargement. It is, as a rule, unwise to attempt to do anything in the nature of retouching or working up upon either the negative or transparency, as every touch is magnified and the work looks very coarse; such work may all be done upon the large plate. Most text-books recommend the use of a camera with a bellows both before and behind the lens, the one end being fitted with frames to hold various sized transparencies and the other carrying the ordinary focussing screen and dark slide. As such cameras now rarely form part of the studio equipment, it will usually be found more convenient to put the transparency in the ordinary enlarging lantern and to project the image upon an ordinary slow plate instead of upon bromide paper. As even slow ordinary plates are much more rapid than bromide paper, it is desirable to make a strip test exposure upon a small plate placed so as to receive the densest part of the image. Ordinary drawing pins will serve to fix this on the large plate in any desired position. When putting the transparency into the enlarger it should be remembered that it is as easy to make a reversed negative for single transfer carbon printing as it is to make a non-reversed one, as we have only to put it in with the glass side toward the large plate if the former be desired. Development and fixing are, of course, conducted as usual, and when finished the negative is ready for retouching or any other "making ready" for printing.

If we decide to adopt the large-transparency method we put the small negative into the enlarger and make our positive upon a slow plate in the same way as just described, remembering to keep the same quality as would be needed for the small one. The large positive may now be retouched and "faked" to almost any extent; pencil and knife upon the film and matt varnish or tracing paper with soft pencil, blacklead and stump or water-color upon the back may all be done. When judged satisfactory the finished positive is put in a printing frame, and the final negative made by contact upon a slow plate. This in its turn may be further worked upon before passing to the printer.

In view of the great cost of large plates it is

well not to forget that for most subjects a smooth thin bromide paper may be used for the final negative, the grain not being noticeable if no attempt be made to render it transparent by oiling or varnishing. The printing will be somewhat slower if the paper be left as it is, but the prints will not only be less granular but brighter. Paper negatives are ideal for working upon, as either front or back will take pencil or chalk to any extent, and for carbon work they may be printed from either side.

Those who possess a knowledge of the carbon process will do well to produce their small transparencies by its aid as they will be absolutely grainless and full of detail in the shadows. Instead of using the ordinary temporary supports the image is developed upon plain glass which has been coated with a substratum of gelatin hardened with chrome alum and allowed to dry. When working with enlarged transparencies the final negative may be made in carbon. Transparency tissue which contains a double quantity of pigment should always be used, or the images will be too thin.

With very granular originals it is often advantageous to use a soft focus lens for enlarging, only a small degree of diffusion being needed. If, say, a Dallmeyer B or D lens be used about one-half to one turn of the adjustment it will destroy the grain without causing the image to appear unsharp. Some single lenses will also give the necessary diffusion if used at an aperture of $f/8$ or larger.

It is obvious that even the cheap fixed focus enlargers or "printing boxes" may be used for the production of enlarged negatives as well as for ordinary paper prints. The transparency is placed in the negative carrier, and the plate in the position usually occupied by the bromide paper, or, if there is not enough depth for this, a flat "Portrait" film may be used. A variation may be made by making a large transparency on film, and from this a negative by contact on another film.—B. J.

A Clientele That Will Last

MANY photographers do not realize the value of building up a photographic department for children. One western photographer knows the value of such a department, and has made it the most important part of his business. He takes many children's photographs and does some novel and effective advertising for the children's department.

In his studio he has a large assortment of toys with which he amuses the children during the sittings. When a child is especially pleased with a certain toy he makes the child a present of it. This proves good advertising, since the parents and the children themselves tell their friends about the photographer who gives toys away with each photograph. It is an especially effective method for pleasing the younger children, who usually cause trouble for photographers. Once a child is won by the photographer, the parents are sure to bring him back the next time they want a picture—*System*.

Gelatin

GELATIN is perhaps the most important raw material used in the production of light-sensitive photographic products. It is the basis of all emulsion-making and without it we would not be able to produce any of our emulsions. It is also the despair of the emulsion maker, for upon the quality and nature of the gelatin depend the character and uniformity of the finished emulsion, and, like any highly complex organic material, gelatin is likely to vary in character.

Gelatin has several important functions in connection with emulsion-making. It is the carrier or protective colloid which holds the finely precipitated silver salts in suspension. Without its presence no true emulsion could be formed. Due to its power of setting to a clear, glass-like film, it renders possible the coating of photographic emulsions upon celluloid, glass or paper.

Apart from acting as the emulsifying agent, gelatin has another very important function. This is its ability to render the precipitated silver salts extremely sensitive to light. If we precipitate silver chloride or silver bromide in water, the precipitated silver halide is practically insensitive to light. The presence of the gelatin during precipitation acts as a control on the structure and during digestion confers upon the precipitated silver salt remarkable sensitivity to light. Without the presence of gelatin it would not be possible to form a latent image upon the emulsion, because there must be present some material which can absorb the halogens which are split off under the action of light.

The manufacture of gelatin for photographic purposes is something very distinct from the usual production of technical gelatin or glues. The very greatest care must be exercised in picking the stock and in the subsequent extracting and clarifying processes.

Gelatin is a highly complex organic nitrogenous material, and none of the so-called gelatins that are purchased are of pure gelatin. There are present other substances, such as chondrin, keratin, mucin and other organic materials. The sources of all these related materials are animal tissues. Pure gelatin is one of the constituents of bone; chondrin exists principally in the cartilage of young animals; keratin is principally obtained from horns, and mucin is usually present in the intercellular structure of cartilage.

A successful photographic gelatin depends upon blending the raw stock so as to produce the proper proportions of these various organic materials. A photographic gelatin must have a high viscosity and must retain it under continued heating. It must have good jelly strength and setting power, and usually the better samples contain considerable amounts of chondrin, a little keratin and traces of mucin. When the manufacturer has decided upon the proper admixture of hide, cartilage, bone, etc., these various raw materials are treated to a

pickling process which softens the material so that the gelatinous compounds may be readily extracted.

Gelatin, as we understand it, does not exist ready-formed by nature in animal tissues, but is produced only upon heating the tissues. This heating takes place after the necessary degreasing, softening and cleaning. The animal tissues are placed in a large vat practically full of water. Means are provided for heating the water with steam, and a large agitating paddle is also fitted to the tank. The water is gradually heated until about 140° F. is reached, and the tissues are agitated at this temperature for several hours; then the liquor is drawn off and at this stage is, of course, a very watery solution of the gelatinous materials. It is then passed through a vacuum evaporator and boiled down under vacuum until the desired consistency or Baumé is obtained.

Directly after this thickening process the necessary preservatives or clarifiers are added and the material is passed through a filter press. From the filter press the liquor is run into molds, usually about 36 x 9 x 6 inches, and these pans are stored away in racks in a chilling chamber so that the gelatinous liquor may set to a solid jelly. When the material is thoroughly solid it is taken out of the molds and sliced into thin sheets with a special machine, using piano wires as the cutting device. This results in cutting up the large cake into a number of thin sheets which are then dried upon fish nets in a specially heated and air-conditioned drying alley. When drying is completed we have the familiar sheets of gelatin, such as we buy in packages.

Throughout the whole process of manufacturing gelatin the very greatest care is necessary to avoid bacterial infection. That is why the whole of the air in a large gelatin plant is bag-filtered, and the utmost cleanliness observed throughout. Unless gelatin is produced free of bacteria, it will have no jelly strength or viscosity, for even if only the remotest trace of bacterial spores is present the whole batch of gelatin is very quickly spoiled, due to the facility for reproduction which gelatin affords.

Gelatins for photography are usually made from the first extraction only and this at low temperatures, but as many as four or five extractions can be made from the same material by increasing the temperature of extraction. The material obtained, however, gets darker and darker colored as the extraction temperatures are raised, so that we go through the range from fine gelatin, technical gelatin and gelatin glue, to common glue. This is the familiar dark-brown common glue of commerce and is the result of the last extraction at a very high temperature.

The reason why it is necessary to use only the first extraction for photographic gelatin is that in such material we cannot have present decomposition products in any large amount and the material must also be water white. It is characteristic of all high temperature

extractions that they contain increasing amounts of decomposition products and the color increases very quickly with rise in the extracting temperature. After all the extractions have been made and the range of materials obtained from fine gelatin to commercial glue, there is still left behind an evil-smelling, sticky mass which is one of the most valuable fertilizers known, because it is a material of extremely high nitrogen content. This refuse is sold to the large concerns who work it over and produce powdered fertilizers; so we see that every available portion of material has its uses for one purpose or another. In photography we use only the finest and purest of the gelatin first extracted, for, as in everything connected with the manufacture of light-sensitive materials, we must have a product produced under exacting conditions and of a specific character suitable for our purpose.—DR. A. B. HITCHINS, in *Portrait*.

On the Fixation of Bromide Prints

THE beauty and sparkle of a bromide print depends more upon careful fixing than is usually thought. Many otherwise good printers make fixing quite a secondary consideration. A freshly mixed bath is essential to obtain the best results in bromide. One which has been used once is only fit for trials and odd prints. A bath which has been mixed some days, even though not used, does not give such clean results as a freshly mixed one. This I have proved, and it is especially noticeable in sulphide-toned prints.

It is essential to good results that the fixing-bath is not overworked. I consider that 150 cabinet prints are all that a 60-ounce bath will thoroughly fix. If more prints have to be put through, the bath should be strengthened with plain hypo solution. The bath gradually gets diluted by passing prints in and out, no matter how carefully it is done. I have found a bath to have increased in quantity by as much as 20 ounces after a junior assistant has put a batch through.

I consider most formulæ demand an unnecessarily large quantity of potassium metabisulphite. Half an ounce is quite enough for a 40-ounce bath. Too much tends to bleach out the delicate detail in the high-lights.

The metabisulphite must be dissolved in cold water separately, and added to the hypo when the latter is quite cold, otherwise sulphurous acid is liberated, which alters the whole chemical action of the bath.

Another effect of putting the metabisulphite in a hot hypo bath is a distinct reducing action. I have seen prints which have almost entirely disappeared in one hour.

The duration of fixing is a very important point, and for best results must be carefully attended to. The first batch of prints in a new bath should be thoroughly fixed in fifteen to twenty minutes, while the second batch in the same bath would require thirty minutes. The bath should be fresh enough for the unreduced silver bromide to be dissolved quickly, otherwise

you cannot get the sparkle you should otherwise obtain.

When prints are to be toned by the bleach and sulphide method, thorough fixing is an all important thing.

Underfixed prints tend to give a cold tone—more of a purple brown.

Overfixed prints give a distinctly yellow sepia. This I have proved.

Prints which tone to the best sepia are those fixed for thirty minutes in a freshly mixed bath. They must go into the fresh bath at once—not in a used bath to begin with.

For black prints also fixing must be carefully done. Overfixed prints have a washy appearance, underfixed ones will eventually develop metallic sheen—and fade away.—*B. J.*

An Optional Method of Print Development

Most photographers who have been using developing papers since the early days have individual methods for getting the results they wish, and I suppose each thinks his own methods the best. This is my apology for offering a development method which I have used with good success myself and which others to whom I have recommended it seem to like.

The fundamental idea of this method is not new. It is the old idea of varying or in the case of a difficult negative improving the character of the print by modification of the developer. This idea was quite prevalent some years ago when photographers were more in the habit of juggling with the bath, but was largely discarded in favor of standardized development, as modification of the developer seemed to require too many different solutions and formulas to keep track of. To avoid confusion and uncertainty, it became the practice to print for complete development in an unchanged bath within a specified time. However, as is generally the case, there was a certain merit in the old method of working, and with modification of the bath simplified as I shall explain, I think there is a distinct gain in flexibility. In fact, one can almost invariably get the kind of print he wants, which with some negatives is a decided help.

The whole proposition resolves itself into the use of a two-solution formula, one for a soft bath, the other for a hard, these two being used in various proportions according to the character of the negative and the effect desired. By altering the balance or proportions of the developer according to the needs of the case, it is possible to secure any desired degree of brilliancy or softness.

The two solutions, one for soft results and the other for hard, are made up as follows:

SOFT BATH	
Water	80 oz.
Monomet	120 gr.
Sodium sulphite	2 oz.
Sodium carbonate	1 oz.
Potassium bromide	60 gr.

HARD BATH

Water	80 oz.
Hydrochinon	240 gr.
Sodium sulphite	2 oz.
Sodium carbonate	1 oz.
Potassium bromide	60 gr.

Two grains of bromide are roughly equivalent to 3 drops of a saturated solution.

For negatives of average professional quality the proportions likely to be found most suitable are one part of the hard solution to three parts of the soft. If the high-lights are chalky and the shadows plug up, increase the proportion of the soft solution. If the high-lights and half-tones look mushy, increase the proportion of the hard. No water should be added. The soft can be used alone, but not the hard.

For obtaining the warmth of tone desired by most photographers, the formula calls for all the bromide that will probably be needed. Decreasing the amount will throw the color toward a colder black; increasing it will throw it more toward an olive green. A point to keep in mind in regard to bromide is that the same amount will give a warmer tone on a paper having a gloss or sheen than on a paper having a soft surface, such as semi-matte or flat. This is because the paper with a gloss or luster surface absorbs less of the chemical than the paper with a matte surface.

A combination bath of this kind does not behave quite the same as that compounded from the regular formula, as the image comes up in a more contrasty, energetic manner, softening as the action of the developer proceeds, but the bath is, however, not difficult to work. The essential points to keep in mind are two: (1) that exposures should be longer; and (2) that development should be stopped as soon as the desired strength is reached—not allowed to continue as far as it will go. The desired strength will be obtained in from 1½ to 2 or in a few cases two and a half minutes, depending on the balance of soft and hard in the bath.

Neither this method of development nor any other I know of will assure success with careless, hit-or-miss exposure; but such a bath will, however, carry a full exposure beyond the usual point of safety and yet retain in it the richness of quality expected in a cyko print. It gives pure rich platinum blacks, with luminous shadows and delicate high-lights and half-tones.—*F. T. HUNTINGTON in Portrait.*

THE *Photo-Revue* suggests the following developer for giving negatives with full detail, when using plates of the ultra-rapid type:

Water	100 c.c.
Anhydrous sodium sulphite	3 gm.
Diamidophenol	0.5 gm.

The temperature of the bath should be 18° C., or about 65° F., and one should not be afraid of prolonging development until the whites become slightly veiled.

Translation of English Formulæ into the Metric System

MR. A. COWAN has published the following: One of the simplest methods of translating, with the least possible trouble, any of our existing formulæ. I take it for granted that everyone using any formula has always liked to know what proportion the various constituents in it bear to one another, so that if occasion requires he can vary any of them according to circumstances. In our old system this has generally been expressed by the number of grains or minims contained in each ounce of liquid used—in my own practice, for many years, I have exclusively used the grain as the only unit for both liquids and solids—and I propose to show by an example how formulæ thus expressed is immediately translated into the metric measures, without the figures losing their old familiar look and sound, which they certainly will do if they are literally translated.

For instance, take one of the simplest formula for pyro development, viz.:

One ounce of liquid containing—

Pyro	2 gr.
Sulphite	8 gr.
Ammonia	4 gr.
Bromide	1 gr.

Ten ounces of this of course contains—

Pyro	20 gr.
Sulphite	80 gr.
Ammonia	40 gr.
Bromide	10 gr.

If we now literally translate this it will read—

Pyro	1.296 gm.
Sulphite	5.184 gm.
Ammonia	2.592 c.c.
Bromide648 gm.

Made up with water to a bulk of 283.5 c.c. nearly.

In this form it certainly does not convey to our minds the proportion that each ingredient bears to the others in so definite and simple a manner as does the original formula.

By leaving the formula alone, let it translate itself by at once calling all the quantities grams, when it will read—

Pyro	2 gm.
Sulphite	8 gm.
Ammonia	4 gm.
Bromide	1 gm.

and the bulk of solution 437.5 c.c.

This bulk of solution will be about fifteen times greater than our old-fashioned ounce, but the figures remain almost without fractions, and can be easily multiplied or subdivided if larger or smaller quantities are required.

I have little doubt but that if anyone habitually using the metric system had originated such a formula as that used, for example, the bulk would have been made up to 500 c.c., or perhaps the amounts of all the ingredients

doubled, and made up to 1000 c.c., as I notice in foreign formulæ an almost total absence of the awkward fractions that occur when translating from one system to another.

In connection with this subject perhaps I may be allowed to suggest the advisability of always making up the total of any new formula to a definite measure, such as 100, 500, or 1000 c.c., instead of, as is often the case, adding the quantities of the various ingredients to a given bulk of liquid.

To Obtain Green Tones

A NUMBER of inquiries having come to us of late in regard to obtaining green tones, we reprint this month a formula for green tones published in *Portrait* several years ago. It has been worked successfully in our own print department, and various users have told us that it gives the green tones they want. Three solutions are required, as follows:

SOLUTION A

Potassium ferricyanide	5 gm. or 77 gr.
Ammonia	5 drops
Water	100 c.c. or 3½ oz.

SOLUTION B

Concentrated ferric chloride	5 c.c. or 80 min.
Water	100 c.c. or 3½ oz.

Or, if ferric chloride is not at hand, one can use:

Ferric ammonium citrate	2 gm. or 33 gr.
Hydrochloric acid	5 c.c. or 80 min.
Water	100 c.c. or 3½ oz.

SOLUTION C

Sodium sulphide	1 gm. or 15½ gr.
Water	100 c.c. or 3½ oz.

Then add hydrochloric acid 5 c.c. or 80 min.

This solution may become turbid but no attention need be paid to that. The toning is done as follows: The print, after washing, is placed in Solution A until bleached through to a light brown. This usually takes from two to three minutes. The solution is now poured back into the bottle and the print washed until the whites are free from the yellow color of the ferricyanide. Upon the thoroughness of this washing the ultimate purity of the whites depends. After washing, the print is placed in Solution B for five minutes, then rinsed once or twice and transferred to Solution C for five minutes.

A short washing completes the process. Should the whites of the print appear tinted pale blue while it is wet there need be no cause for alarm, as the discoloration practically disappears after drying.—*Portrait*.

Potassium ferricyanide and red prussiate of potash are the same thing. The pure should be clear ruby crystals. Both crystals and solution should be kept in the dark.

Photographic Materials and Processes

[Photographic] tone reproduction; Theory of—
with a graphic method for the solution of problems. L. A. Jones. Communication No. 88 from Eastman Kodak Research Lab. J. Franklin Inst., 1920, 190, 39—90.

THE relationship between the appearance of a photographic print and that of the object represented by it is dependent not only on the qualities (characteristic curves) of the negative and positive materials used in making the reproduction, but also upon the conditions of observation, the chief factor in this respect being the variation of the sensitiveness of the eye to brightness variation with varying degrees of illumination. The various factors are considered in detail, a new system of terminology and symbols being used, and a graphic method of combining curves given for investigation of various relationships when certain of the factors are known.

Photographic printing process without silver bromide. K. Wilcke. Phot. Korr., 1920, 57, 173—175. Chem. Zentr., 1920, 91, IV, 380.

THE process depends on the increase of electrical conductivity of selenium on exposure to light. A glass plate, provided with an excessively thin coating of gold or platinum, is placed in intimate contact with a thin sheet of selenium. In contact with the other side of the selenium is placed a sheet of paper soaked in a solution of some substance, such as potassium ferrocyanide, which gives a colored substance on passage of an electric current; the paper is backed up by a metal plate. When the glass side of the system is exposed in a camera, an electric potential difference being applied to the gold or platinum film on one side and the metal plate on the other side, a reproduction is obtained on the paper.

Photographic emulsions; Size and sensitiveness of the grains in —. T. Svedberg. Z. wiss. Phot., 1920, 20, 36—50.

IN considering the blackening-law (*Schwärzungsgesetz*) of a photographic plate and the behavior of the individual grains contained in it, the view that the law is a consequence of the lack of uniformity of the photochemical light-field inside the film is negated by the work of Lüppo-Cramer, Scheffer and others, and by the author's own experiments with very thinly coated plates for which the usual type of characteristic curve was obtained. The possibility that each grain obeys the law of the plate appears to be inadmissible, since this size of grain resulting by development appears to be dependent on the amount of development and not on the exposure. In experimental examination of the two remaining possibilities, viz., that each class of grains of approximately equal sizes obeys its own law, or that only an emulsion

with grains of varying sizes obeys the law, uniform thin coatings of very dilute emulsions were used; after exposure and development the plates were treated with a silver solvent (acid potassium permanganate solution or acid potassium bichromate solution) and photomicrographs of the resulting films taken with a linear magnification of 1000. Prints of the micrographs were made with a further magnification of 4 and the grains for a definite area of each print counted and assorted into four classes of size with the aid of a screen ruled in sq. mm. The grains counted in this way are, of course, those which are not developed, and the numbers and sizes of the developed grains have to be obtained by comparison with the same emulsion untreated. Tables and curves are given for one type of plate, showing the relationship between exposure and percentage of grains affected in the four size-classes, and between size of grain and the percentage number attacked; the curve for the former is similar to the usual characteristic curve and that for the latter to an exponential. Similar results are given for solarization exposures, for hydrogen peroxide effect and for ordinary chemical fog, and the results are all in general agreement with the view that the larger grains are the more sensitive.

Photographic Method of Detecting Changes in a Complicated Group of Objects. (Abstract, Scientific Paper, No. 392.)

A NEGATIVE is made of the group of objects in which a change is expected. After the change is supposed to have occurred, a second negative of approximately the same density as the first is made with the same camera (or one of the same kind) on a plate of the same kind and from as nearly as possible the same position as used in making the first negative. A positive is printed from one of the negatives, is superposed upon the other negative so as to bring them into register, and the combination viewed against a source of light. When the photographs are properly made, those parts of the combination which correspond to the unchanged portion of the group of objects will appear as a field of practically uniform density, while a change in the group will be revealed by a considerable departure from this uniform density.

It is very desirable to make the negatives and positive of considerable contrast and at the same time confine all exposures to the straight-line portions of the characteristic curves. To secure the best results the positive should have a contrast equal to the ratio of the contrast of the negative superposed upon the positive to the contrast of the negative from which the positive is derived.

The method has for some time been used to a limited extent in astronomy and physics. It was independently devised by the present author about three years ago and developed for camouflage detection, engineering and other purposes in cooperation with Dr. H. E. Ives of the United States Air Service.

PATENT NEWS

Colored photographic images and method of producing the same. J. M. Blaney, Verona, N. J., Assignor to Prizma, Inc. U. S. Pat. 1,331,092, 17,2,20. Appl., 22.5.18.

By treatment of a silver image with a solution of a suitable tin salt an insoluble tin compound is deposited on the image and this is then colored by treatment with a dye solution.

[Photographic] color-filter negative and process of preparing the same. J. A. H. Hatt. U.S.P. 1,349,956, 17.8.20. Appl., 28.12.18.

A FIRST negative is prepared by exposure through a suitable color-filter and a second negative by exposure through a different color-filter and through the first negative in contact with the sensitive surface and in registration with the image of the picture. The second negative is used for the preparation of the printing plate.

Celluloid products [photographic films]; Process for treating [recovering silver from]— F. W. Horton, U.S.P. 1,350,157, 17.8.20. Appl., 13.1.20.

FOR the recovery of silver from photographic films they are treated with a solution of caustic alkali and the metal precipitated from the resulting solution.

Photographic films; Process of making — E. M. Flaherty, Assr. to E. I. du Pont de Nemours & Co. U.S.P. 1,350,274, 17.8.20. Appl., 5.12.18.

A SOLUTION of nitrocellulose and camphor in butyl acetate and a diluent is fed on to a revolving drum on which it is partly dried, and the resulting film then stripped off, dried, and reeled in a continuous operation.

Ferroprussiate paper; Manufacture of — E. Bertsch. G.P. 320,981, 6.7.18.

ABOUT 10–20 per cent. of an alkali oxalate is added to alkali ferric oxalate solution before treatment with ferricyanide. The yellow product remains unchanged in the dark, and on exposure to light changes to emerald green, greenish-blue, bright blue-green, yellow, gray and finally bright yellowish-gray. The treated paper has an intense blue color after washing and drying, the lines being white.

To Mount Paper on Metal. Make an adhesive of $\frac{1}{2}$ ounce gum tragacanth, 2 ounces of gum arabic, and 8 ounces of water. Dissolve and strain, using hot water for dissolving the gums. This is also a good adhesive for mounting prints on wood.

Professional Photographers' Club of New York

THE last two meetings of the Professional Photographers' Club of New York were devoted to exhibition and study of the famous E. K. gum-print effects displayed at the National Convention. The instructions on the process and formulæ by Mr. C. F. Becker were highly appreciated.

A discussion on a proposition for coöperative publicity also took place. This discussion brought out the fact of the incompatibility of coöperative advertising while some individual advertising photographers still maintain competitive cheap-price publicity. The proposition was for the present tabled, but the discussions proved of great interest.

The members were very happy to again meet the ex-president, W. B. Stage, who, after a protracted illness, is now returning in better health and with renewed vigor to his former activity and moving to a new studio, 740 Madison Avenue, New York.

THE PROFESSIONAL PHOTOGRAPHERS' CLUB OF N. Y., INC., E. CHAIT, Secretary.

White Backgrounds

EXCEPT in the work of a few experts, it is rare to find really fine quality of image, hardness, or flatness being the most general faults. This is, we believe, due in most cases to the fogging effect of the large expanse of white behind the sitter, which is most troublesome when the background is separately illuminated, as is often done to secure perfect opacity in "sketch" portraiture. The result is that if adequate exposure be given to the figure the shadows are fogged, while with shorter exposures, which are usually accompanied by full development, hardness and a blacking of the high-lights follows. A great improvement will be secured by reducing the amount of light which falls upon the lens. This may be done either by using a small background which is only just large enough to cut to the edges of the trimmed print, or by using a mask, which effects the same purpose, fixed in the vignette holder, as recommended for another purpose a few weeks ago. We recently tried the experiment of using a white reflector about three feet square as a background for a head, and found a great improvement when compared with a similar head taken against the ordinary eight feet square white ground.—B. J.

A FORMULA for a combined developer-fixer for ferrotype buttons, etc., is as follows:

Water, to make	40 fl. oz.
Hydroquinone	$\frac{1}{2}$ oz.
Soda sulphite	4 oz.
Soda carbonate	4 oz.
Hypo.	8 oz.
Liquor ammonia .880	2 fl. oz.

Addition of more ammonia to the developer gives more vigor. The plates develop (and partly fix) in two or three minutes. They can then be examined in daylight and fixed in plain hypo.

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IS THERE A DIRECT COLOR PHOTOGRAPHY PROBLEM?

ACCORDING to the opinion of the layman and, indeed, of the ordinary photographer, nothing short of the production of pigment colors by direct action of light upon some sensitive surface akin to the ordinary photographic film meets the demands for photography in natural color.

This was the only view taken by the early investigators—and, indeed, their work did accomplish in a measure the requirements; Niepce, Becquerel and others actually reproduced, in a direct way, nature's color, but it was found impossible to fix these colors and some doubt was expressed as to the actuality of the process as a solution of the problem. That is, the reproduction of color was explained by the objectors of the validity of the result as manifestation merely of the phenomenon of the interference of light. In fact, beautiful reproductions in color were subsequently made by the method of interference.

The direct method of color photography has always been carried on even by scientific experimenters in an empirical way.

There was no scientific basis for the methods which were tried, and really it looks as if some fortunate unexpected discovery will give us a direct method, if a direct method be at all possible, for some of the most distinguished scientific investigators, among whom we find the name of the late Sir William Abney, are not at all sanguine of such a fortunate discovery.

Despite the rather positive pronouncement of those scientific men who look doubtfully upon the accomplishment of a direct color scheme of reproduction, no one is candidly convinced that it is a positive impossibility.

In the light of what modern science has effected, it is purely gratuitous to dogmatically assert any possible accomplishment improbable. It is well to have in mind the truth that few of the great problems that have engaged human

intellect have been solved along the lines of procedure set down for their solution.

Indeed, the academic procedure of limitation to prescription, how a matter is to be investigated, often retards original discovery.

To get into a groove of thought is tantamount to being stuck in the mud—and in that condition even Jove (as Æsop tells us) is not inclined to answer fervent invocation.

We, who are a little on in years, can remember how nearly half a century ago there were complicated mechanisms which uttered a few stilted phrases in imitation of the human voice and those who marveled at the ingenious, complicated and cumbersome apparatus divined that progress must necessarily be along the line of the same method.

But you know how Edison came along and made the thing a success with a simple piece of apparatus constructed on a new principle never before thought of. And may it not be so with the reproduction of color. Understand, we are not harking back to the Niepce method, but look forward to the discovery of some new principle or the application of some known old one, which may guide to a successful issue.

But Niepce's plan is so peculiar and so interesting and so characteristic of the way the problem was then tackled, that it will be of value to all who are interested in the study.

Niepce started out on a theory, anyhow, and did not go about it in a hit or miss way, as too many have imagined would reward them with the unexpected. Niepce thought that an analogy might exist between the color given to a flame by certain chemical bodies and the color to be impressed upon the sensitive plate by its selection from the various color bands of the solar spectrum. Sodium, for instance, colors the flame yellow; strontium, red; chloride of nickel, green; chloride of copper and ammonium, blue, etc.

Becquerel already had shown when sodium chloride was used with silver nitrate to get silver chloride—that this silver chloride was differently colored by the different color rays of the spectrum. Subsequently it was found that this was due to the reducing action of the blue rays—and oxydization by the red rays, but Niepce, not knowing this, imagined that if the chloride of strontium, which communicates red color to a flame, were used in place of the sodium chloride, by the same reason it would reproduce the reds of nature's color, and the other various salts which gave characteristic color to flame would likewise act selectively in coloring the sensitive surface and that those chlorides which did not communicate any color to flame would reproduce black and white.

Niepce did get some sort of coloration, which he enthusiastically considered as approximating color rendition, but his results were not convincing and the real cause of both his results and those of Becquerel were long years after shown to be due to the cause which Lippman showed to depend upon a purely physical cause, having nothing to do with chemical interchange.

A retrospect of the phases of any great discovery reveals the fact that the means for the accomplishment of the much desired end may be present to such



SKETCH PORTRAIT, MRS. R.

KARL TAUSIG
NEW YORK



A MOVIE ACTOR

KARL TAUSIG
NEW YORK

ROYAL PHOTOGRAPHIC SOCIETY, 1920
PITTSBURGH, 1920
TORONTO, 1920

a degree as to fairly cry out for their application. No one appreciates what a source is at hand till some genius comes along and makes it manifest. It has been so with the telephone, wireless, radiography, and, in fact, every great advance in science, and may it not be so with direct color reproduction? Some one will arise who sees the relation of the means to the end sought and then we all marvel how blind we have been to obvious facts, someone who sees the abstract in the association of the concrete, an imaginative mind, who links phenonema and gives us a new creation.

*MAKING STILL PHOTOGRAPHS TALK— N. B. AUKERMAN

THIS subject reminds me of the man who borrowed a ten-dollar bank note from his friend to perform a trick in legerdemain, and after tearing it into four pieces, he tried to unite it again by some charm or magic several times, but unsuccessfully, then passed it back to his friend saying, "I'm sorry, but I guess you'll have to paste it together, it's a mighty good trick, however, if I could do it." So I feel about this subject, it's a mighty good story if I could tell it. Nevertheless, it's a subject in which we are all vitally interested, not only in making our photographs talk, but to have them use the proper language. To tell their story convincingly, modestly and truthfully, in a way that is interesting, constructive and helpful, educational as well as beautiful and with harmony which stops short of monotony.

A photograph may be beautifully executed and yet tell its story so quickly as to lose its point of effectiveness, as in the case of a roadway or stream leading away for miles in a straight line, with a group of trees here and a building there and broad acres between, it is a generality that it is always seen at a glance, nothing left for anticipation or imagination.

The old saying is surely true in this case that "anticipation is more interesting than realization," and this is how we want our photographs to talk interestingly.

A roadway leading out of sight in the near distance invites one to follow or anticipate the view beyond. This anticipated view is ideal in proportion to the extent that the visible portion of the picture has affected our sense of beauty. So, then, by the study of some established principles and working along the proper lines with a definite knowledge of what we wish to do and how to accomplish it, we will make much faster progress and eliminate much unnecessary effort.

When a chemist wishes to find the composition of a certain product he depends on analysis, he ascertains just what elements the product is composed of and the proportion of each, also as nearly as possible their relation toward each other and how they are combined. This is science, and the same method

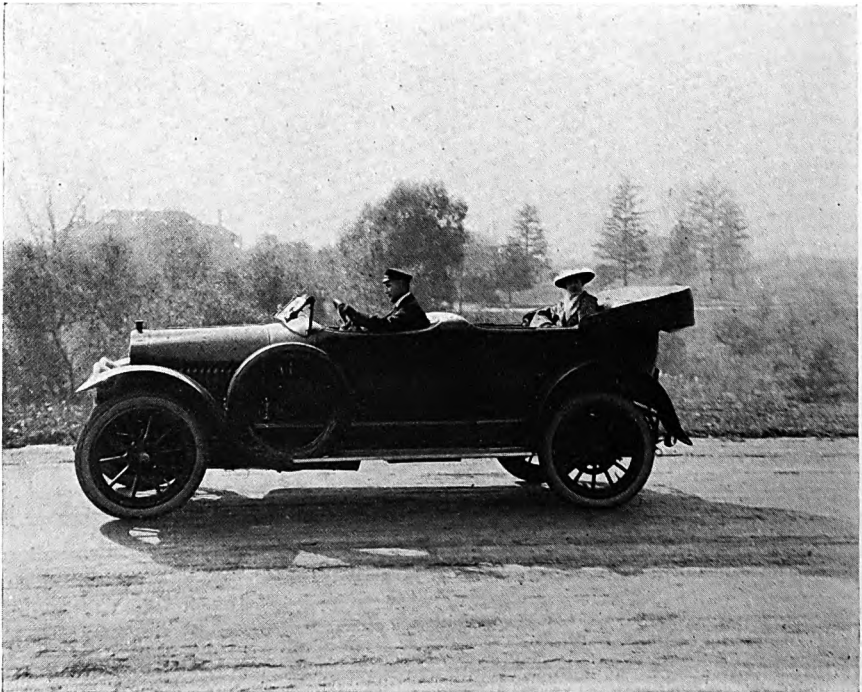
* A talk given before the Commercial Photographers' Section of the P. A. of A., at Milwaukee, in July, 1920.

is employed in photographs, the analysis consists of comparison of parts or subjects and their relation to each other.

When we want to know what makes our photographs good, or what makes our picture better than another almost like it, then we analyze it and learn how the objects composing the picture are combined to make one unit that is pleasing. We all know that we can combine sulphuric acid with a clear hypo solution and have it remain clear, but we had to learn through science how to do it.

So there are rules more or less definite for judging a picture, which are also a great help in making one, inasmuch as the knowledge permits one to judge much more quickly whether or not a group of objects will make a picture. One must have a knowledge beyond the length of exposure, kind of developer or the brand of paper to use; one must have the deeper knowledge, including science, in order that a glance may be sufficient.

Photographers may not be any more famous for being scientific, but they are compelled to become scientific because they have embraced a profession which includes science. The progressive element in photography is the scientific element, and the most important of these elements is composition. The poet-philosopher, Emerson, declared he "studied geology that he might write



NO. 1

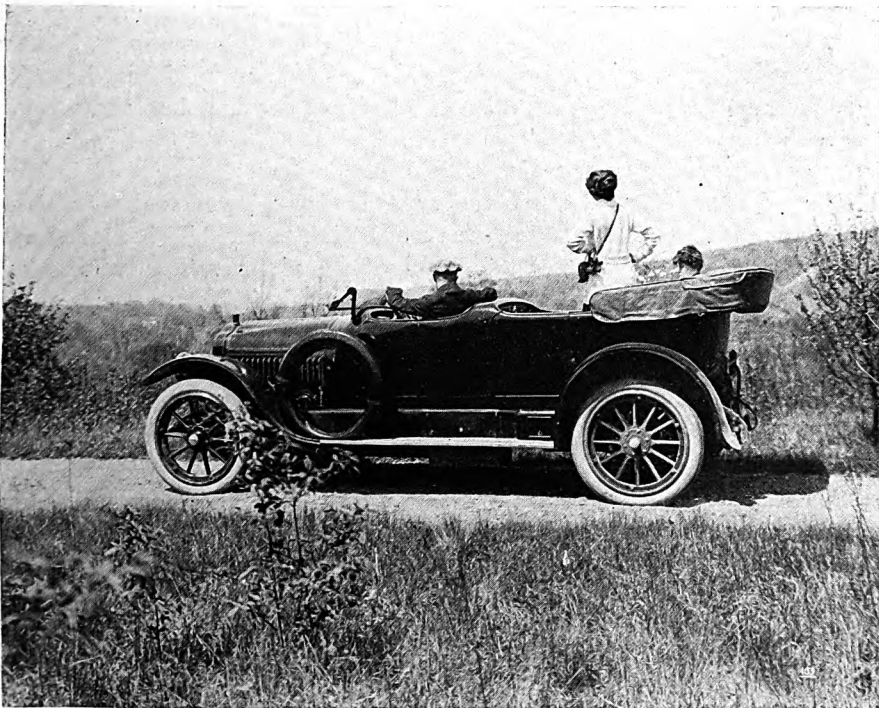
better poetry—just so the photographer might study composition that he may make better photographs.

Composition is like sugar in the definition of the small boy, who said, "Sugar is what makes things taste bad when you don't put it in." Then there are many principles of composition, the pyramid, figure eight or S curve, oval, etc., but these are all subject to the greatest of all principles of composition, which are, the unity of balance, balance of line of mass and of color harmony or ratio. The question of balance has never been reduced to a definite science or set of principles which could be substantiated by anything more than example, unsubstantial as this may seem and difficult as it is to clearly express in words, it is seen and felt by the worker as clearly and certainly as if they were rules written for him to follow.

Suppose we draw a vertical and a horizontal line through the center of a photograph—the vertical line is most important because the natural balance is always on the lateral side of a central support.

The center of the photograph, then, should be the actual center or pivot around which the component parts or objects group themselves, pulling and warring for attention—this pulling and warring give action, and action talks.

We should realize that every object in a picture has a certain pulling



NO. 2

power or attraction for the eye, and while obtaining attention for itself, establishes a proportional detracting for every other object, on the principles of the balance scale, thus the further from the center an object is, the greater is its attraction, using the center as the fulcrum and lever idea. Therefore, it will be found that a very important object, placed only a short distance from the center, may be balanced by a very much smaller object on the other side, but further removed from the center. The whole of the pictorial interest may be on one side of the center and the other side be practically useless as far as beauty or interest is concerned, and its only reason for being there is for balance alone.

The problems of the photographer are the same as the painter, except the latter has the advantage of elimination, which is denied the former in the same manner; hence the photographer must pick and choose, eliminating in mass by change of position or change of lens to exclude some or include more and often carry this eliminating process to the negative and even to the print. This principle of balance, however, must be maintained, and if you will get this clear, I am sure you will soon be using it without knowing just how or why, it becomes an involuntary action.

Now, by giving a more definite form to these masses, we have placed on the chart we evolve a well balanced sketch, with the lines of interest leading from one side to the other, then down and back again.

I would suggest, however, that while we take advantage of any criticism, we should also not allow adverse criticism to discourage our efforts, because recognized critics sometimes disagree. This is because the idealized portion of the picture, which is controlled by the visible portion, has affected the critics differently.

Another phase of composition which frequently serves us well is illustrated in photograph No. 1. It has more particularly a psychological effect of setting up motion—you will notice the front of the automobile is placed near the margin, giving the effect of going out of the picture. The chauffeur is looking straight ahead, which also adds to this illusion. Now, by cutting off the photograph close to the rear of the automobile you notice the action diminishes very decidedly, yet at the same time maintains its balance.

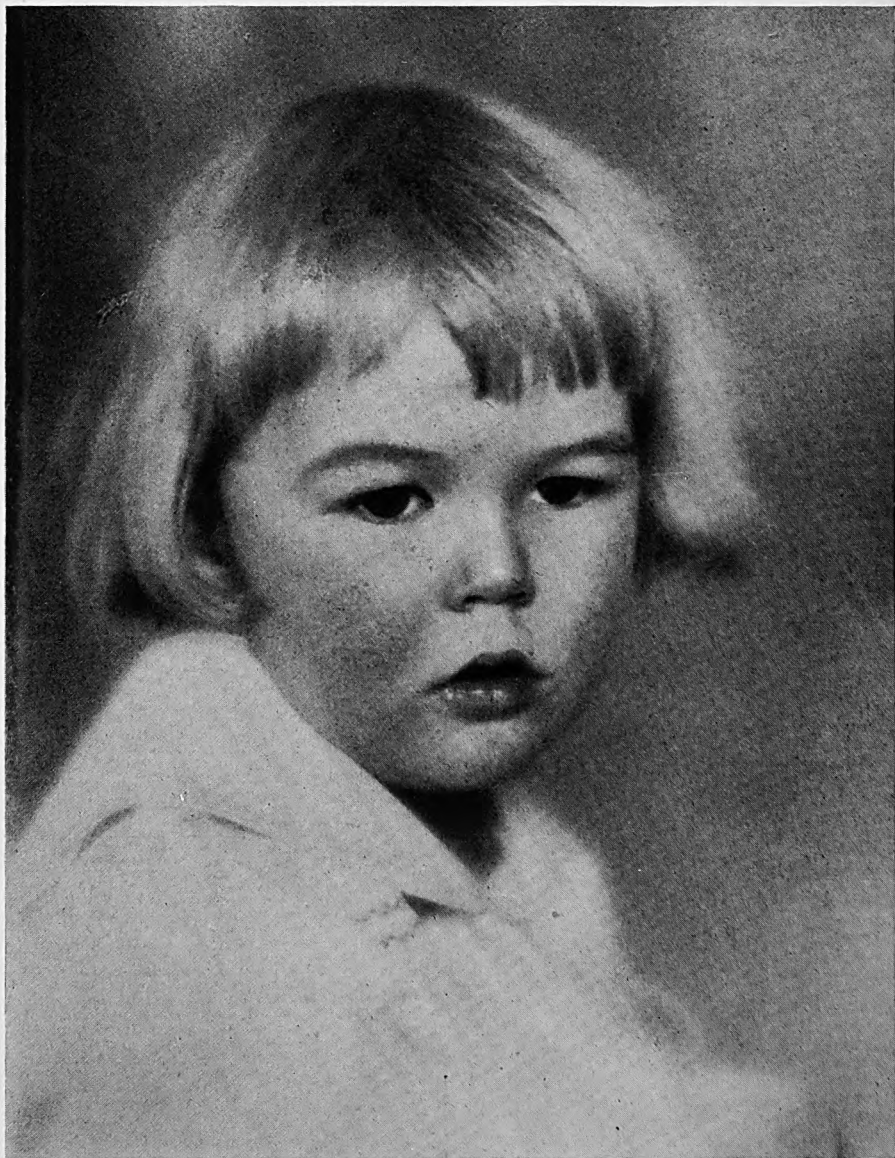
In photograph No. 2, we have the opposite effect—the automobile is placed with more space in front, the chauffeur is turned away from the wheel, the other occupants of the machine are interested in the view from their point of vantage, the whole scene is one of quiet, yet the strongest impulse of the picture is one of invitation or desire to climb into this automobile with the other occupants and enjoy the beautiful scenery of the surrounding country. It creates a desire to possess. I think you will agree with me, that if our photographs do actually create a desire to possess, then they do talk and they serve the purpose we desire.



HON. EVAN MORGAN

KARL TAUSIG
NEW YORK

BLUE RIBBON GRAND PORTRAIT CLASS
ATLANTIC CITY CONVENTION, 1920



PITTSBURGH, 1920
TORONTO, 1920

"THE SPELL OF THE FAIRY TALE." KARL TAUSIG, NEW YORK

PHOTOGRAPHING THE TRANSIT OF VENUS IN 1874

[We are reprinting a paper written for the *American Journal of Photography*, in 1899, by the late William H. Rau. We republish this particular article by Mr. Rau because it gives such evidence of that energy of character and determination of purpose to undertake whatever is most difficult and bring to successful conclusion.

A reading of this paper will give some idea of the delicate methods demanded and of the appreciation of thorough knowledge at the instant in an enterprise of such critical moment.

The photographs accompanying are the personal work of Mr. Rau.]

IT may be necessary, for the benefit of some of your readers, to briefly explain what a transit of Venus is, and why it is so important to make careful observation of it, that governments like England, France and the United States fit out at great expense expeditions which sail to far distant parts of the globe, for the sole purpose of registering the results of a phenomenon, which occupies but a few hours in duration.

The transit of Venus is the passage of the planet Venus across the disk of the sun, where it appears as a small black ball, against the sun's luminous disk.

The object of observing the transit is to accurately determine the distance of the sun from our earth, which distance is, as you know, the measuring line for determining the distance of the planets and fixed stars.

Of course astronomers had methods of approximately finding out the distance of the sun, but it was not till 1677, that Halley suggested the means by observing the transit of Venus. Venus had already been seen crossing the sun by Horrox, in 1639, but the next transit did not take place till 1761, and then Halley's suggestion was acted upon, as well as in 1769. The next transit did not occur until 1874, in the photography of which the writer of this paper had an opportunity of assisting. It being the first transit at which photography was called into service, it may be of interest even to those who assisted at the subsequent transit, 1882.

The next transits will occur in 2004 and 2012, but it is probable before that time that astronomical science will have discovered other methods of determination of the sun's distance, not requiring such long journeys, the expenditure of so much money, as well as the combined labor of the principal governments of the world.

Venus is nearer the sun than we are; now, when she passes exactly between the sun and the earth, two observers placed at two extremities of our globe do not see it projected on the same point of the sun and the difference of the two points leads to the knowledge of the angle which gives the sun's distance.

It was for this purpose that expeditions were sent to the extremities of the earth to make observations.

The English and French Governments sent out a number of expeditions. The United States dispatched eight parties in 1874. Three were sent to the Northern Hemisphere and five to the Southern Hemisphere, all in the eastern part of the Globe.

The Southern Expedition, consisting of five sections, sailed from New York, June 8, 1874, in the U. S. S. Swatara, stopping at Bahia, in Brazil, thence to Cape Town, South Africa.

The first party was to be located at Crozet Island, 2,500 miles S. E. of Cape of Good Hope, as the most favorable spot, but as it was impossible to land, it was taken to Campbell Town, Tasmania. The second party was landed at Kergeulan Island, or Desolation Land.

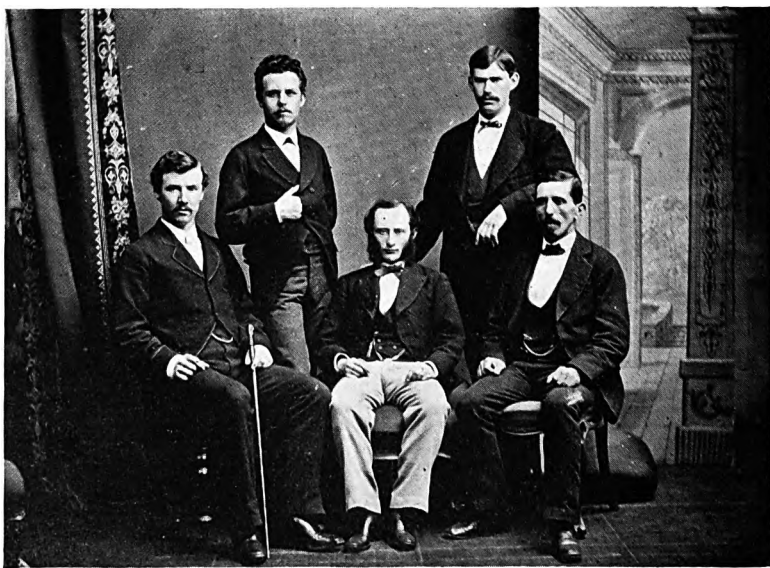
The third party was carried to Hobart Town, in Tasmania. The fourth to New Zealand, at Bluff Harbor.

The fifth party, to which we belonged, landed at Chatham Island, entering Whangaroa Bay, the only port capable of accommodating our ship, October 19th. Our party consisted of Edward S. Smith, of U. S. Coast Survey, chief; Albert H. Scott, assistant; Sumner Taintor, mechanical expert, and Mr. Buehler and myself, the photographers.

We encamped on the rocky shore upon the domain of the owner of a sheep ranch; the raising of sheep and wool being the chief industry of the land. Our habitation included seven tents, sleeping rooms, parlor, dining room, store room, kitchen and toilet room.

Our observatory was set up on a hill about 500 yards back of the camp, which we named Venus Hill, in honor of the planet whose photograph we were about to take.

Our readers will remember that the modern gelatine dry plate was not then in existence, and we could not furnish ourselves with a stock of Carbutt, Cramer, or other desirable surfaces for exposure, but had to make our plates right on the spot.



THE TRANSIT OF VENUS PARTY. MR. RAU SECOND FROM LEFT (STANDING)

Our plates were of thin extra quality plate glass coated with albumen while dry, and not wet, as was the practice at that time. They were then flowed with the collodion, dipped in the silver bath and exposed while still wet.

The object of dry coating with albumen was to lessen the risk of expansion of the film, as the measurements required are so minute that the breadth of a hair difference would make considerable difference in results.

The first point of contact of the planet occurred between one and two o'clock, the transit ending about 6 P. M. Every plate was numbered by a mark with a diamond in the corner and placed in grooved boxes.

Four silver baths were employed, one man coating the plates while another placed them in the holder, and after the exposure was made the plate was at once developed and fixed.

This operation was continued with the regularity of clock work. During the photographing our chief likewise was making with the equatorial 5-inch objective instrument, his observations on the hill.

We had considerable difficulty in carrying our water from a well which was at some distance from the hill. We called into service for our bath, etc., a barrel of distilled water which we had from the ship.

Our apparatus was set up in a dark house constructed for the purpose, as



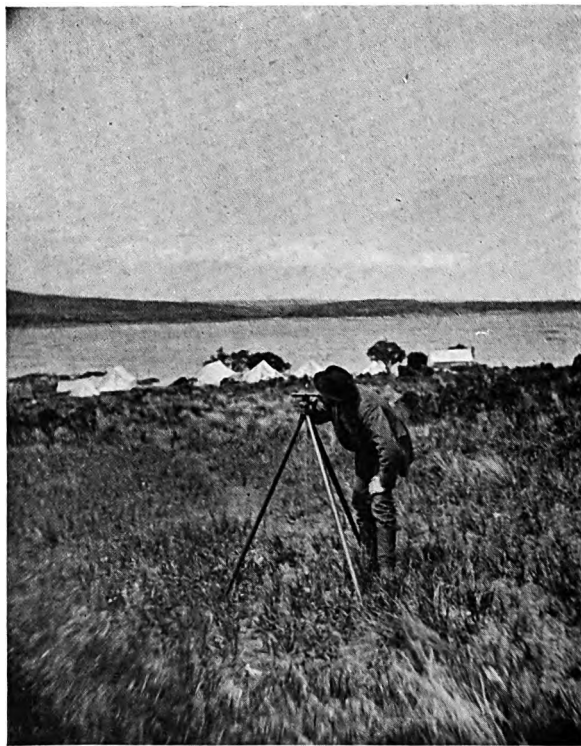
TRANSIT HOUSE AND INSTRUMENTS

will be seen in the photograph. The image of the sun was photographed without the intervention of an enlarging lens. The telescope was placed horizontally and the rays reflected into the object glass by a mirror suitably mounted and regulated by clockwork, so as to keep the sun's image stationary during exposure. The image was a little over four inches in diameter. Just in front of the sensitive plate, which was fixed to a specially constructed plate-holder, was placed a plate of glass ruled in squares, with a mark in the center. Between this and the collodion plate hung a fine wire of silver, suspending a plumb-bob. In this manner the finished negative was marked into squares and also showed the image of the plumb-line, indicating exactly the position of the vertical.

The photographic telescope was exactly in line with a meridian instrument, and so determined with the utmost precision the direction in which it was pointed.

Knowing this, and the time any picture was taken, it was possible with the help of the plumb-line image to exactly determine the orientation of the photograph.

The day the ship left us on the island and went back to Hobart Town, a fire broke out in our camp from the accidental ignition of a wax match, but fortunately, the valuable apparatus in the tent where the fire originated, had been



SURVEYING WANGOROA BAY

removed. We were supplied with provisions for a year, not expecting to find that English colonization had made considerable progress in the country.

The English settlers assured us of the harmless character of the natives, though they had been but recently reclaimed from cannibalism. We became acquainted with a Moravian missionary, who has done much good work amongst the natives. The natives are the Moriori and the Maori tribes, and we received frequent friendly visits from them after the completion of our observations. For, from the time of our landing up to the beginning of serious work, everything in the camp was conducted with military discipline, and the whole company was daily subjected to drill, so that at the critical moment there might be no danger to the results from want of discipline.

We made a few excursions over the island and saw traces of recent cannibalism in the remains of human bones.

The vegetation is considerably stunted. Its growth is no doubt checked by the constant wind which never stops blowing. Indeed we had to devise certain means to prevent it interfering with our observation and while photographing.

Our sojourn was during the summer. The winter must convert the place into a dreary waste.



CABIN BUILT BY THE WRECKED CREW OF THE "ALABAMA"
ON CHATAM ISLAND

We were picked up by the U. S. S. Swatara, January 6, 1875; stopping at New Zealand and then at Hobart Town, thence at Melbourne. The Swatara left us here and continued her voyage around Cape Horn, carrying with her the apparatus and results of the observations; but we sailed on the Pacific mail steamer by way of Fiji, the Samoan and Hawaiian Islands to San Francisco, coming home by the Central & Union Pacific R. R.; the whole voyage occupying very nearly a year.

THE YOUNG PHOTOGRAPHER'S PROSPECTS—THERMIT

IF the young people who enter the photographic profession in a year, it is safe to say that only a small percentage do so with any sound reasons for their action, or any definite ideas concerning their future.

If I were to ask the numerous juniors of my acquaintance what had brought them into the business, I would get in most cases such an answer as, "Well, I had to get a job of some sort when I left school," or "My father apprenticed me to it," or (from a girl) "I had a friend in so-and-so's studio, and they were short-handed, so she got me a place there," and so on. In one case only would the answer be, "Because I like photography and think I can get on in it." Which goes to show that the profession is not invariably taken up with the deliberation that is almost always essential to success.

When I was young I had an idea that only money mattered, and that if one had the necessary money to open a business of one's own one's fortune was made. This was a wrong view altogether, for though it is possible for a financier to run a successful studio, his success is purely a business one, which is not the same thing as photographic success. Our most eminent photographers have not all been capitalized to start with.

Now, although many of us are in photography more by accident than by design, it is never too late for the junior to take an interest in the future. To do this, it is necessary to find out first of all something about the trade and something about our own capabilities, and to see how the two can best be adapted to each other. Now the plums of photography are scattered among many branches of the craft, and no branch has plums for everybody, and so a matter for careful decision should be the particular branch to be followed. As it is, there are many fields for photography about which the average junior is entirely ignorant, and I have met assistants who believed that professional (as distinct from amateur) photography, began and ended in the portrait studio. But besides studio portraiture we have "at home," flashlight, and theatrical portraiture, commercial, trade, amateur finishing, press, process, cinema, and aerial photography, radiography, photo-micrography and research. And we ought to include manufacture, dealing, and camera making and repair, as these involve photographic knowledge, and photography proper is dependent on them.

Preference given to any one branch of the photographic industry should depend on one's own inclinations and abilities, and on the remuneration, working conditions and prospects in the particular line. Then the prospects of a trade are dependent on the future state of that trade, which may be subject to that of some other industry or profession. Natural inclinations and abilities may, for our purpose, be divided into three classes: artistic, scientific, and business, and one or other will be required in some degree, no matter what branch we favor. The person with artistic leanings, and without much inclination toward chemistry, mechanics or optics, might with advantage concentrate on portraiture. Lighting, posing, retouching, working up and coloring all demand the artistic temperament. They are not confined to the studio, the first three being necessary in all classes of portraiture, while the last three are in demand in trade houses. The remuneration for all these classes of work depends largely on individual skill, and, to some extent, along with working conditions, on the particular firm worked for. There are at present no definite rates, hours or conditions, though in houses of repute it is possible for a good worker to make a living without killing him or her self in the process. Now the S.A.U. are interesting themselves in the welfare of photographic workers, better rates and conditions may result, but I doubt that photographic art will ever be as well paid as boilermaking or coal mining, and I put this down largely to the fact that female labor is usually obtainable for next to nothing. The exponent who has the necessary skill and experience to float off on his own, either in a studio, or as a flashlight and "at home" expert, should realize a handsome profit on artistic ability, but it should be remembered that to be one's own master requires business acumen and personality, without which disaster rather than success will ensue. Which reminds me that it is not safe, either as one's own master or as the employee of another, to take our artistic ability for granted. Failing qualified instruction and experience, it is necessary to have the opinion of one who knows, and if such opinion be adverse and one is encouraged to follow some other line it may prove a blessing in disguise.

The young worker who has no liking for the artistic side of photography is not tied to remain all his or her days as a mere "dark-room hand." The field for the study and practice of photographic technique is a very wide one, and the amount of skill and knowledge attainable in this line is unlimited. Unfortunately, studio portraiture in the aggregate does not demand or inculcate any great degree of technique, and technical workers of marked ability are few and not at all well paid, as the term is understood today. The worker with technical ambition who wishes to get on in the studio should study negative making, printing (in more than one medium preferably), developing, fixing and toning, from the chemical and physical standpoint rather than the old-fashioned rule of thumb system. Having acquired some fundamental knowledge of the processes and the chemicals used in and applicable to them, the next thing is to get into a firm where such knowledge is considered an asset. It goes without saying that it will be an up-to-date house, and most likely one

whose work is distinguished for a unique standard of quality. Better openings occur for good technique in trade and commercial houses, where the making of a negative or print may demand individual treatment, and where first-class results may be imperative from poor originals or under adverse circumstances. Besides dark-room technique, a knowledge of cameras and lenses and their use in all sorts of places is essential to commercial photography. A lot can be learned from actual practice, but the facts which govern the possibilities of camera work can all be acquired from books and articles on commercial photography. Considered as a means of livelihood, commercial work has many advantages. Not only is the work interesting and educative, but it is—from my own experience and information—comparatively well paid, and has a future. As the title would suggest, commercial photography is photography for commercial people, and it is practiced in two ways. One firm will send for a photographer when occasion demands. These firms are catered to by independent commercial photographic companies, by studios who run commercial photography as a sideline, and by free lances. Other firms keep a photographer to attend to their requirements. Thus the aspirant to success has more than one possible channel to his desires. He may obtain a post with a specialist firm or in a studio where this work is undertaken; he may—if he has sufficient knowledge or a little experience, or a big lump of self-confidence—apply direct to manufacturing people for photographic work, or he may hunt out companies who keep their own photographers and apply for a post on the premises.

"Amateur finishing," as our American friends call the developing and printing of snapshots, finds employment for a small amount of technique. Owing to the fact that most of this work is mechanical and practically automatic, it is largely in the hands of young girls, and technical knowledge is not essential for the rank and file. As this work grows to huge proportions for a few months each year, and it becomes almost impossible to keep pace with the demand, some one having a comprehensive knowledge of the technique of developing and printing must be in attendance to guard against breakdowns. I am aware that some developing and printing departments are run without any really qualified labor, but from a pretty deep experience in the line, it is a marvel to me how they escape disaster, when one considers all the possible things that can happen in a photographic workshop, and how easily high-pressure work can be upset. To foresee, prevent, detect and cure the frills and blisters, the stains and stickings, the losses and spoils of a big department in the summer, demand something over the average qualifications, and, on top of this, the routine must be planned out and provided for, and the special requirements of customers considered. These last alone are not to be smiled at, and the person who can cope with the technique of developing and printing should be appreciated. A good knowledge of practical enlarging is an asset in this line.

There are two kinds of press photography, professional and free-lance, and while they both exist for the same object—supplying the press with illustrations

—they are widely different in character. The regular press photographer is retained by a paper or journal, and practices on specific jobs. He must be capable of rapid action, and able to get results under all sorts of circumstances, at all times and in any weather. The man with a genius for getting something out of nothing, and that in the minimum of time, should do well as a press photographer. Compared with many others, this branch of photography is fairly well paid. Free-lance work, as the name would suggest, is speculative, and pays according to the energy, skill and good luck of the one practicing it. It differs from regular press work also in the style of work done and the greater choice of working conditions. For example, photographs of notabilities, civic functions, sports, city fires, etc., are usually supplied to order by the regular man, but pictures of general interest, such as summer scenes at health resorts, rural festivities, and curious odds and ends from out-of-the-way places, are largely supplied by the free-lance. It is easily seen that the latter do not require the prompt action or the ability to surmount obstacles that are often necessary for the former. The free-lance can very often pick his subject and time, and if the first shot fails there may be still time and opportunity to repeat the negative. On the other hand, he should get better negatives than the regular man, who cannot possibly put technical quality first. Free-lance photography is generally paid for monthly at a fixed rate, and as the same picture may be accepted by more than one journal, quite a handsome return is possible to the worker who can deliver the goods.

Process work is the connecting link between photography and the other trades connected with printing and publishing. It is mainly technical work, suited to the individual who likes careful, methodical work-room practice. Process workers are employed by newspapers and other publishing concerns, and also by large printing works. The pay in this line is comparatively good.

The best paid photographers at the present day are probably the men who actually take the big cinema plays. I don't pretend to know the qualifications necessary for such positions, but a pictorial worker with both studio and outdoor experience should be able to master the work. The star camera men, however, are only the minority, and of the more numerous lesser lights and dark-room people my information is conflicting. It would seem, however, that with the flourishing state of the cinema trade work in this line should be constant and have prospects.

While aerial photography has proved its place in war, it has yet to find a firm footing in the civil and commercial circles, and radiography and photomicrography are also in their infancy, viewed from a purely professional standpoint. Both of these are valuable pursuits, and should be of interest to the young exponent to whom the future is most important. The radiographer is in demand by surgeons and hospitals, the micrographer by scientists and metallurgists; and in all probability he will be highly appreciated by founders, engineers and metal merchants in the near future. The radiographer must know something about electricity, and the micrographer needs a good technical grounding in both photography and microscopy, besides which other

subjects are useful, if not absolutely essential. These subjects will depend on the nature of work in hand, and may be of chemical, metallurgical, botanical or other nature.

For the purpose of this article, research and manufacture can be treated together. Not that they are alike, but because the only paid field for the former will be found under the auspices of the latter. Every manufacturer of any standing employs purely photographic labor besides the actual manufacturing labor. The former is used for testing materials and formulæ, for investigating complaints and new ideas and for making specimens. It will be seen from this that a good all-round knowledge of photography is useful in a photographic material factory. The remuneration and prospects of photographers so employed vary according to the work, and from what information I have, are not bad. Here, as elsewhere, sinecures are not the rule, but there are certainly good positions to be had by the right people.

Besides technical and artistic workers, the manufacturer also employs what I might call business photographers, commonly called travelers, commercials, and "men of the road." I may be told that neither these gentlemen nor dealers' salesmen are photographers, and in many cases this is so; but this does not alter the fact that photographic knowledge is a decided asset to either, and the young photographer with some personality and business sense might do worse than turn his attention to salesmanship. Whether behind the counter or on the road, this is a clean, gentlemanly job, and though I cannot give actual figures, I know that the men who sell are frequently better off than those who manipulate. While speaking of salesmanship, I must not forget the studio receptionist, who has much in common with the dealers' salesman. Like him, she requires personality, a knowledge of the photographic wares she sells, and some business sense. Like him, she may rub along without these qualifications or with the first and third only, but to be a real success at any kind of photographic salesmanship it is necessary to understand the nature, quality and actual worth of the goods sold. Good taste and artistic sense are also valuable assets to the receptionist, while more mundane matters like bookkeeping and typing are required in the more businesslike studios.

The camera maker is as far removed from the professional practice of photography as the salesman, but, like the latter, he is essential, and requires to know something of photography in order to master his craft. Unlike the salesman, the camera maker must be a practical or technical worker, and his work is eminently suitable to those of a precise and mechanical turn of mind. Fine wood work and metal work are required in camera making, and also a knowledge of optics and mechanics, though these things are not essential to young assistants and apprentices. They are, however, a *sine qua non* to the one who would become a designer or even a repairer. There is a good demand for cameras and repairs, a demand which increases from year to year, and unless we allow Germany to take the market from us, the future should provide plenty of work for the camera maker and the camera repairer.

While I have outlined the principal fields for remunerative photography,

I do not pretend to have covered every possibility of the serious photographer. The craft is used in various other ways and places, and work is to be found in government offices, advertising firms, and other diverse places. Thus it pays the young worker to acquire a sound knowledge of the principles that govern photographic work, and to make the most of his experience as time goes on. This brings us to the question of education, the higher forms of which are not within easy reach by every young photographer. This is no reason why any worker should remain in doubt or stay in a rut, however, as we can all read, and photo-literature is exhaustive without being expensive.

PORTRAITURE AT THE CAMERA CLUB

THE Camera Club, New York, gave a one-man show of pictorial portraiture from December 15, 1920, to January 25, 1921, comprising fifty-three examples of the work of Mr. Karl Tausig, New York,

Mr. Tausig is one of the younger group of portrait artists who has come into prominence recently as a result entirely of excellence in handling his subjects and the quality of his work. He is versatile in his results, for he appears to be equally proficient in rendering men, women and children. For instance, "The Lady and the Dog," "A Movie Actor" and "Cousin Bill"—all hung at the Royal in 1920—were presentations of a woman, a man and a child. This holds good all through his exhibit.

Among the examples were two blue-ribbon portraits—awarded at Atlantic City, 1920—entitled "Master Tom," received in the home portrait class, and "Hon. Evan Morgan," in the grand portrait class; and these are both very outstanding in excellence. The collection embraced also "Hilarity" and "Sketch Portrait of Mrs. L.," both shown at The London Salon, 1920, and selected as among American representative prints for hanging at The Camera Club, London. These both rank among the best work produced in recent years.

The following leave little to be desired in pose, expression and presentation: "The Old Philosopher," "Sketch Portrait of Mrs. R.," "Wonder Eyes," "Rhoda," "The Spell of the Fairy Tale," and "Sketch Portrait of Mr. L.," and were all accepted at Pittsburgh and Toronto, 1920; likewise "Daniel," seen at Pittsburgh and "'Huck' Finn" at Toronto. Others that are masterly are "The Coquette," "When John Henry Smiles," "Sweetness," "Study of a Boy's Head," "The Comedian," "A Sister of Mercy," "Margie," "Mother, Dear," "My Son," "Sweet Motherhood," "A Country Lad" and "The Madonna of the Ghetto."

All of Mr. Tausig's pictures were home portraits; all were taken with a 12-inch Smith Visual Quality lens and were in sizes from 8 x 10 to 24 x 30; all were made on 5 x 7 plates and all printed on Artatone. This ought to teach that a studio for amateurs is not absolutely necessary; that much is often to be gained by using only one lens, one focal length, one size plate and one printing medium, except in special cases; at any rate, that premier honors can be gained without a number of outfits and many accessories.

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So many of our readers have requested us to publish a Question and Answer Department that we have secured the services of Dr. Alfred B. Hitchins, Ph.D., F.R.P.S., who will answer questions relating to technical matters, processes, working instructions, etc., and the utmost will be done to insure reliable and practical answers being given.

Correspondents are requested to first state their case, and then number each question. They should also write on one side of the paper only, and enclose correct name and address—not necessarily for publication. No attention will be paid to anonymous communications nor to those only signed with initials.

We will do our best in all cases to publish the replies in our next issue following the receipt of the inquiry, but cannot absolutely guarantee this.

Death of Sir William Abney

We reprint the following from the *British Journal of Photography* of the death, on Thursday, December 2, at the age of 77, of Sir William de Wiveleslie Abney, at Folkstone, where he had been staying for the benefit of his health.

Sir William Abney had contributed for

so many years, and in so many ways, to the investigation of the technical processes of photography that no brief notice of his work can adequately represent its scope and extent. The very diversity of his labors is a cause of embarrassment to a reviewer of them, for he concerned himself as much with the improvement of photographic methods on empirical lines as with the investigation of the scientific principles of photography. As a result, his contributions are scattered through a wider field of periodicals than are those, probably, of any other photographic experimenter. Many of his papers are to be found only in the *Proceedings of the Royal Society*; many others are distributed in the *Journal of the Royal Photographic Society*, in the *Photographic News*, in the *British Journal of Photography* and its "Almanac," and in *Photography*, to which latter journal he was for some years a regular contributor of editorial articles. His writings on photography thus present a difficult task to the bibliographer, and one which is not lightened in any measure by the treatises on photography which Sir William Abney wrote. In these latter, "Instruction in Photography" and "A Treatise on Photography," the student gets scarcely any indication of the original papers and articles which largely contribute to their texts.

Sir William Abney became a lieutenant in the Royal Engineers in 1861 and captain in 1873, subsequent to which he was for some years instructor in chemistry to the Royal Engineers at Chatham. He retired from the army in 1881, and in 1884 was appointed assistant director for science in the Science and Art Department of South Kensington, becoming a director in 1893 and assistant secretary in 1899.

In photography his name will take its place as that of almost the only scientific man of the last century who continuously occupied himself with the study and improvement of photographic technics. From his earliest years as a young lieutenant he took a very great interest in practical photographic work. A notable instance of this is his application of the fact, observed by J. R. Johnson, that the action of light on bichromated carbon tissue persists after the exposure to light has ceased. Lieutenant Abney, as he then was, was quick to show the usefulness of this observation in reducing the time of exposure in making carbon prints. But his chief contributions to photographic practice came with the introduction of the dry-plate emulsion. He was prominent in the advancement of emulsion making, and is particularly noted in this field for his invention of the gelatinocitro-chloride, or print-out emulsion, which subsequently, when introduced as P. O. P. by the Ilford Company, revolutionized photographic printing in this country. He also

was the first to introduce hydroquinone as a developer of bromide emulsion.

But Sir William Abney's most notable experimental work related to spectro-photography, color, and color vision. In 1883 he was awarded the Rumford medal of the Royal Society for his researches on spectrum analysis. So far as the development of scientific methods of photographic investigations is concerned, his interest would seem to have been diminished rather than have been stimulated by the appearance of the paper by Hurter and Driffeld in 1891. His attitude towards the new doctrine then enunciated was one largely of opposition on the ground of distrust of the experimental data which Hurter and Driffeld had obtained with a photometer of the grease-spot type. A lively discussion ensued, in which Dr. Hurter, who was three months the junior of Captain Abney, showed himself the more agile and explicit controversialist. The dispute on experimental methods is now ancient history, which those who are interested can re-traverse in full in the collected researches of Hurter and Driffeld, published by the Royal Photographic Society, under the editorship of Mr. W. B. Ferguson. But Sir William Abney appears not to have perceived the potential fruitfulness of the ideas which were first put forward by Hurter and Driffeld; and in subsequent editions of his "Instruction in Photography" the work of Hurter and Driffeld is scarcely appraised at the value which later experiments have attached to it.

Nevertheless, by general consent, Sir William Abney's books on photography are the most valuable of those in the English language. His "Instruction in Photography," first published in 1871, has passed through eleven editions; his "Treatise on Photography," issued as one of the Longman's Text Books of Science in 1878, has likewise appeared in a large number of editions. "Photography with Emulsions," long out of print, was the only work which adequately dealt with the making of dry-plate emulsions. He was also the author of a text-book on the Platinotype process, and, in collaboration with H. P. Robinson, of one on silver printing. Although not a facile expositor of scientific matters, he wrote a popular work on "Color Measurement and Mixture," published in 1891 by the Society for Promoting Christian Knowledge. Sir William Abney was elected a member of the Royal Photographic Society in 1870, and admitted a Fellow in 1895. He was the president of the Society for three periods, namely, from 1892 to 1894, in 1896, and during the years 1903 and 1905.

Talks on Photography

THE inner mysteries of the art of photography were explained by Dr. C. E. Kenneth Mees at the Franklin Institute, on December 2, in a lecture on "The Structure of Photographic Images." Dr. Mees, who is the director of the research laboratories of the Eastman Kodak Co., showed by lantern-slide illustrations the amazing genesis of the picture by the groupings of infinitesimally small grains of silver halide, which, under the influence of light, become transformed into coke-like masses of silver.

By reason of the smallness of these grains, it becomes possible to photograph objects down to an almost invisible point, which may afterward be enlarged to any given size. This was utilized during the Franco-Prussian War in 1870, Dr. Mees said, to send microscopic photographs of dispatches by carrier pigeons from besieged Paris to the French troops. A synopsis of his address follows:

"The sensitive emulsion of a photographic film, when examined under a microscope of very high power, is found to be composed of tiny crystals in the form of flat plates imbedded in gelatin. Each of these microscopic crystals is sensitive to light, and the image is produced by the transformation of the crystals during development into minute coke-like masses of metallic silver, only the crystals which have been exposed being developable, and those which have not been exposed being removed by the immersion of the film in the fixing-bath.

"A few million crystals are required for each of the single pictures used in motion-picture film, and yet the sensitiveness to light of each crystal can be studied separately and special measurements are being made of the relation of the sensitiveness of the single crystals and their size, because the properties of the film depend to a considerable extent upon variations in the size of the crystals present.

"When the developed grains are magnified they become visible, and at even a low degree of magnification they are visible in clumps. Thus the motion-picture film when magnified and shown on the screen is not smooth, and those who sit close to the screen can see that it has a grainy structure.

"We have been measuring the graininess of the structure in order to determine how best to reduce the graininess without affecting other properties of the film and thus enable higher magnification to be used without prejudicing the appearance of the picture. When an image has to be very much magnified, as, for instance, when it has to be studied under a microscope, it is found that the image is not indefinitely sharp, but that it depends not only on the

lens, but on the crystalline green structure of the film itself. The fineness of detail which can be distinguished is limited to details of about 100th of an inch, and if points on the film are nearer together than this they cannot be distinguished clearly in the picture.

"If it is necessary to magnify pictures very much they must be made on special materials which are very fine-grained, and, therefore, very insensitive to light. This was done during the siege of Paris in 1870, when the dispatches which were sent out of the city fastened to carrier pigeons were photographed down to very small dimensions and were then studied through microscopes by the recipients. The structure of photographic images has practical importance not only in connection with motion pictures, but also in many other branches of applied photography, notably in astronomical work."

The Alkalies Used in Development

THE various alkaline salts used in the compounding of the developer in the manipulation of the gelatine negative are used rather indiscriminately, without any regard to the particular action or with reference to the getting of any special result from the plate. The character and relative action of the alkalies ought to be considered, so as to enable one to intelligently make application for a definite purpose.

First, there are the salts of sodium, which are found in commerce in several different forms, and it will be found by the careful experimenter that the form or condition of the sodium salt materially affects the evolution of the image during the process of development.

In the crystalline form of sodium carbonate, or, as it is commonly called, "soda," we have associated a large quantity of water of crystallization. The actual solid portion of sodium carbonate is less than 37 per cent., the remainder being pure water. This, understand, is the pure variety of soda. What is denominated "washing soda," used in kitchen economy, contains, beside the 63 per cent. of water, numerous other impurities, as, for example, the not desirable sulphate of soda.

The available amount of carbonate of soda in such specimens is probably not more than one-third. The presence of the sulphate of soda, if even in slight excess, is detrimental to the developer, and the results are not the same as when a pure alkali is used. Crystals of sodium carbonate, when exposed to the action of the atmosphere, undergo a change. In the pure condition the crystals are almost transparent, but the air soon coats their surfaces with a white powder, from the loss of the

water by the crystals. This loss, in one sense, is a gain, because it really increases the amount of sodium carbonate in the specimen. If the crystals are exposed to the air long enough they break down into a white powdery mass, which is found to contain as much as 86 per cent. of the sodium carbonate, or two and one-third times as much as that of the original crystals.

It would follow, therefore, that this dry carbonate of soda is the more desirable form to employ in the constitution of the developer, because it is more constant than the variable variety, containing water of crystallization. We accordingly find that our formulae call for the dry or anhydrous salt of sodium (granular carbonate).

Some formulae are not explicit in indicating whether the quantity mentioned is dry or crystalline, and you may see how this oversight may lead to error.

Caustic soda, or sodium hydrate, is also employed in making up developers. It is frequently an accompaniment of hydroquinone. In using caustic soda the greater care is demanded, that its purity is insured, than when ordinary carbonate is employed. The impurity here is our carbonate, which may be detected by adding to a solution of caustic soda any acid, which liberates the carbonic acid gas in effervescence.

Another alkali is the potassium carbonate. It is almost as uncertain in its quality as the soda salt in crystalline form, and demands as much caution in its use. The best form is what is known commercially as "salts of tartar," which is virtually chemically pure.

Impure varieties of potassium carbonate are contaminated with sodium chloride and sodium sulphate, and frequently to a considerable extent.

Potassium carbonate, in its pure granular form, is perhaps more used than the sodium salt, but it must not be forgotten that the softening action on the gelatine film is greater. Fortunately, as a rule, one-half the quantity by weight replaces the soda crystals, and with pyro the amount may be even reduced.

One point in using the various alkalies should be noted. Caustic alkalies represent developing power in the unchecked form, while the carbonates really are agents having associated with them a restraining agent, namely, the liberated carbonic acid. If we take equivalent proportions of caustic soda and anhydrous sodium carbonate and saturate each with sulphuric acid the same quantity of acid will neutralize 1 part of the caustic soda (hydrate), or 265 parts of the carbonate, forming in each case the same quantity of sodium sulphate; but in the former case a molecule of water, while in the latter we have a molecule of carbonic acid. If now, instead of applying

the alkaline equivalent of the two for the formation of the salt, and apply it to our development we have, in the one case, untrammelled action of a definite quality of sodium hydrate (caustic soda), where water only is associated, and in the other case carbonic acid, which undoubtedly would act restrainingly in the developer. We know that carbonic acid does act as a restrainer, because we cannot effectively use sodium bicarbonate (baking soda of the kitchen) as an alkaline constituent in our developing solutions.

Precaution in Fixing Baths

The acid fixing bath is a veritable boon to the photographer who works during the prevalence of torrid atmosphere, particularly if the hot air is moist. The inimical action of such atmospheric conditions upon the film is the *bête noir* to the photographer. But with the attendant advantages of the acid fixing bath there are some associated disadvantages which plain hypo is not guilty of, and so some manipulators prefer the plain bath, and have recourse to prophylactic hardening by use of formaldehyde, though this procedure is attended with trouble, if the film is found to need intensification or reduction. So after all we may be allowed to prefer the use of the acid bath, inasmuch as the mishap with its use may be prevented by exercise of care in manipulation, judgment in administration and strict observance to the formula requirements.

When the acid bath becomes particularly milky, then look for yellow stain or brown discoloration all over the film. Alum, where hypo is present, releases the sulphur. Now if there is present acetic acid and sodium sulphite, a sulphurous acid is liberated which prevents the release of the sulphur, but the sulphite must be pure, if there is any sulphate in it (which too often is the case) then sulphur is formed in a very divided state and we have the milky look—and this will happen, too, even if pure sulphite is used, which has been left open to the action of the air.

Having observed this precaution, next, be sure that the hypo is thoroughly dissolved before the other ingredients are added, and add the acetic acid last of all and only in small increments with constant stirring. Keep the solution cold. It is cold immediately after the hypo is dissolved, but if you let it stand it soon gets of the same temperature as the surrounding air.

Do not over work a fixing bath, particularly if prints are the subject.

A Method of Producing Reversed Dye-Images

J. I. CRABTREE

In the course of a series of experiments on the effect of an acid-hypo solution on various dye-solutions and samples of tinted motion-picture film, it was observed that on immersing certain samples of tinted film in the acid-fixing solution, the dye was bleached out in the region of the silver-image, while the highlights remained unaffected—producing a result opposite to that of toning, namely, tinted highlights and black-and-white shadows.

The possibilities of utilizing the phenomenon in producing dye-images was at once realized, and by simply removing the black silver-image in a suitable solvent of silver, such as Farmer's reducer, after bleaching as above, a reversed dye-image was obtained, that is, starting with a positive silver-image a negative dye-image was obtained.

In the following experiments images on motion-picture film were used though the methods are applicable to any gelatine silver-image.

NATURE OF THE DYES EMPLOYED

The effect under consideration was discovered when using methylene blue, but on testing a large number of other dyes it was found that dyes such as methylene green and, in general, dyes which are readily reduced to the leuco base can be used also.

THE BLEACHING-BATH

It was found that two methods of procedure are possible as follows:

1. Bleach the image in a mixture of the dye- and bleaching-bath.
2. First dye or tint the film and then bleach.

1. The following acid-hypo bleaching-bath was used in the preliminary experiments:

ACID HARDENER

Alum	56 gms.
Sodium Sulphite.....	56 gms.
Acetic Acid 28%.....	400 c.c.
Water to.....	1 liter
For use: Hypo (25% solution).....	100 vols.
Acid Hardener.....	5 vols.

In order to determine the active bleaching agent in this bath, tests were made with mixtures of dye and the individual ingredients in various combinations, and it was found that hypo in combination with hydrogen-ions is the active bleaching agent. Thus, the following mixtures, as enumerated below, are inactive:

Hypo + Dye
Dye + Acid
Dye + Sodium bisulphite

while, on immersing an image in a mixture of dye + hypo + acetic acid or sodium bi-

sulphite or acid hardener, good results are obtained.

The following bleaching-bath was found to give the best results:

Methylene blue..... 1 gram
Hypo 5 grams
Acid Hardener..... 2.5 c.c.
Water to..... 100 c.c.

On immersing a positive image in this solution for three or four minutes, the dye enters the highlights whereas the shadows remain clear; so that on washing and removing the silver-image as described below, a negative dye-image is obtained.

2. By first tinting the film and then bleaching, stronger dye-images were obtained as follows:

Immerse the film for two or three minutes in the following bath and rinse:

Methylene blue..... 1 gram
Ammonia (concentrated). 0.1 c.c.
Water to..... 100 c.c.

Now bleach in the following acid fixing-bath until the shadows are black and free of dye:

Hypo 5 grams
Acid Hardener..... 2.5 c.c.
Water to..... 100 c.c.

After bleaching, wash for about ten minutes in running water and remove the silver-image.

TIME OF BLEACHING

When using method 2—if the bleaching is prolonged beyond a certain point—the dye in the highlights commences to bleach out until, on prolonged bleaching, all the dye disappears. On subsequently removing the silver—so as to reverse the image—very peculiar line-images are obtained, if the bleaching is prolonged beyond the point when all the dye is bleached in the shadows. It is better to bleach in a weaker bath than in a strong one, since this permits of greater latitude in working. With the above formula from one to two minutes is an average bleaching time. Around normal room-temperature (65° to 75° F.) small changes in temperature have very little effect on the rate of bleaching.

REMOVAL OF THE SILVER-IMAGE

After bleaching, the film should be washed about ten minutes in running water and immersed in the following bath of the Farmer's reducer.

Hypo 2.5 grams
Potassium Ferricyanide.. 1 gram
Water to..... 100 c.c.

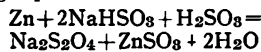
After all the silver is removed, the film should be washed for five or ten minutes and dried.

Other silver-solvents, such as a solution of iodine in potassium cyanide, iodine in thiourea, potassium ferricyanide and ammonium thiocyanate, can be used in place of the Farmer's reducer.

THEORY OF THE PROCESS

The action of the bleaching-bath is apparently to reduce the dye to the colorless leuco base in the region of the silver-image, the leuco base washing out of the gelatine more rapidly than the dye. This leaves a reversed dye-image with black silver in the highlights, so that on removing this silver a reversed dye-image is obtained.

The precise action between silver and acid hypo in the presence of methylene blue is difficult to explain. It was at first considered that the reaction between the silver-image and the acid-hypo is analogous to that between zinc and sodium bisulphite to produce zinc hydro-sulphite and sodium hydrosulphite as represented by the following equation:



Sodium Hydrosulphite + Zinc Sulphite

However, it was considered that silver is too noble a metal for the above reaction to occur in the absence of hypo, and this was confirmed by the following experiment:

Finely divided metallic silver was heated for thirty minutes to boiling with a 25 per cent. solution of sodium bisulphite to which was added 1 per cent. of acetic acid. On adding a little of the supernatant liquid to a solution of methylene blue, the dye was not decolorized, though, on repeating the experiment with the addition of hypo to the acid bisulphite, the liquid decolorized the methylene blue at once, thus indicating that a powerful reducing-agent was produced. A blank experiment, which consisted in heating together hypo and acid bisulphite, showed that this mixture alone does not reduce the dye except in presence of silver.

These experiments confirm the practical photographic results, namely, that hypo is necessary for the reaction between the silver and the acid bisulphite to occur. In the case of zinc, the presence of hypo is not necessary.

The exact chemical nature of the substance formed which reduces the dye has not been discovered. During bleaching of the tinted film in acid hypo, the silver-image turns yellowish brown and its light-transmitting power is visibly increased. On treating the bleached image with a 30 per cent. hypo solution or 5 per cent. potassium cyanide some of the image is removed, leaving a residual image apparently of silver which is soluble only in silver solvents—such as Farmer's reducer.

The above explanation raises the question as to whether any reaction takes place in the ordinary course of fixing out a silver-image in an acid fixing-bath in the absence of methylene blue. Certainly no visible change in the image occurs at normal tem-

peratures in two or three minutes with no apparent change of color. Previous experiments have shown that silver dissolves slowly in a solution of hypo in the presence of air (the oxidizer), so that if methylene blue is regarded as the oxidizer, the analogy in the case of the oxidation of silver by a mixture of acid hypo and methylene blue is complete.

A number of other bleaching-baths can be used in place of the acid hypo, such as an acid solution of stannous chloride, acid amidol, and acid cerous nitrate.

Several difficulties were met with in producing good dye-images as follows:

1. BLEEDING OF THE DYE

After dyeing in a plain solution of the dye, rinsing and bleaching, it was found that the dye washed out readily, in fact, almost as readily as the leuco base so that weak dye-images were obtained. Attempts were, therefore, made to mordant the dye as follows:

A. By mordanting after dyeing by means of known mordants for basic dyes such as phosphotungstic acid and tannic acid. After dyeing the film was given a short immersion in a 1 per cent. solution of phosphotungstic acid (which mordanted the dye almost completely) and then washed for ten minutes. This treatment resulted in patchy images and it was not easy to subsequently remove the silver-image in Farmer's reducer.

B. By mordanting after bleaching and washing and before removing the silver better results were obtained, though some streaks appeared after removing the silver as above.

C. The best results were obtained by adding ammonia to the dye-bath in the first place, which increases the rate of dyeing and retards the rate of bleeding on washing.

2. RE-OXIDATION OF THE LEUCO BASE

The leuco base of methylene blue is readily oxidized back again to the dye by suitable oxidizing agents and under certain conditions with certain bleaching-baths and washing in water containing dissolved air, after bleaching and washing the leuco base is oxidized back to the dye so that the film assumes the tinted condition again. The addition of a trace of sodium bisulphite to the wash-water tended to retard this oxidation.

Re-oxidation also occurs in the Farmer's reducer, if all the leuco base has not been washed out after bleaching, which explains the necessity for washing after bleaching in the acid-hypo.

POSITIVE DYE-IMAGES

During washing of the image after bleaching in the Farmer's reducer, it was observed that in some instances a positive

image was obtained—that is, the leuco base was mordanted to the silver-image and was reoxidized to the dye while the dye in the highlights washed out, thus producing a positive image from a positive.

The mordant, in this case, is silver ferrocyanide formed in the Farmer's reducer. A silver-image when bleached in a mixture of ferrocyanide and a trace of hypo is converted to silver ferrocyanide, which in a finely divided condition is a powerful mordant for basic dyes. If, therefore, after bleaching, the image is only slightly washed the leuco base remains, and on bleaching in the Farmer's reducer is mordanted to the silver ferrocyanide image, and is oxidized to the dye. On prolonged washing, the methylene blue is washed out of the highlights, leaving a positive dye-image.

TONING AND TINTING

Interesting effects are obtained by dyeing, bleaching and washing, and without removing the silver, immersing in a uranium toning-bath or by dye-toning the silver in the usual way. The result is that of a toned silver-image with the highlights tinted. This, of course, is distinct from the usual toned and tinted effect where the dye-layer covers the entire film.

Line-effects are produced by prolonging the bleaching in the acid-hypo and subsequently toning the silver-image as above. The effect is that of a toned silver-image with line-lighting and tinted highlights.

Odd tinted effects are obtained by merely dyeing and bleaching and washing, and prolonging the bleaching time a little above the normal.

SUMMARY.

Reversed dye-images can be obtained by first dyeing a gelatine silver-image in a dye which is capable of being reduced to the leuco base which is more readily washed out of gelatine than the dye, and after tinting, bleaching in an ordinary acid-hypo bath, washing, and subsequently removing the silver-image in a solvent of silver, such as the Farmer's reducer. The excellence of the results depends largely on the correct time of bleaching and on the thoroughness of washing after bleaching. If the washing is not thorough—on immersing in the Farmer's reducer—the leuco base is mordanted to the silver ferrocyanide formed so that, on prolonged washing, the dye washes out of the highlights leaving a positive mordanted dye-image.

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Optical Glass and Its Future as an American Industry*

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THE problem of preparation for a war in which the scope of its technique and the wealth of the available resources are both practically unlimited, will hardly be comprehended at a glance by any one, whatever his previous training may have been. It is an absolutely baffling task. By way of illustration consider artillery fire, which during the Civil War was practically always point blank; that is, aim was taken directly at a nearby object, either in plain view or partially concealed by smoke. The effective range was rarely more than 3000 yards, and the pieces were pointed by instinct or by sighting along the barrel, but none of the present day equipment for ascertaining the range of very distant objects was then thought of. Few of the guns were rifled at all, high-power explosives had not been discovered, muzzle loading by hand was nearly universal, and except for the old-fashioned siege mortars high angle fire was not attempted.

The artillery practice of the present war included, as will be recalled, the remarkable achievement of bombarding the city of Paris from a distance of about seventy-two miles. Moreover, in the regular daily artillery battles naval guns were frequently concentrated to "cover" an opposing battery which might be distant ten miles or more, perhaps be completely concealed by intervening hills or trees, and which sometimes occupied no more space than an area fifty or sixty yards square. Moreover, it is told of this kind of fire that it frequently was so successfully concentrated that such batteries were completely wiped out by a single avalanche of high-explosive shell.

Artillery practice of this character necessarily requires instruments of the highest precision and of complicated mechanism which are capable of adjustment for nearly all variations of service conditions including allowance for atmosphere changes high above the earth. It is thus easy to see that not only must a high degree of mechanical skill be worked out in advance to

provide this technique, but the glass of which the optical parts of the instrument are made must be of the highest perfection in order not to vitiate this technique when developed.

The problem of supplying optical glass in adequate quantity and perfection was, therefore, one of the most serious problems confronting the ordnance departments from the first moment when our entry into the war was seriously considered. There is no possibility of accurate fire control without optical glass.

At the end of March, 1917, a committee was appointed from the Naval Consulting Board to inquire into the supply of optical glass of quality suitable for fire control instruments for the use of the military and naval forces of the United States in the event of our participation in the war. This is the first action of record, so far as I am aware, to obtain a supply of this absolutely indispensable material.

The situation may well have been deemed precarious, for the reason that at that time the European war had been going on for nearly three years and the available supply of imported glass in the hands of American manufacturers had become seriously depleted in filling contracts with various allied powers. In point of fact, substantially all of the optical glass of the first quality on hand in this country in 1914 had been manufactured and exported in finished instruments, and none of the allied governments had been willing, after the outbreak of the war, to allow such an indispensable material to be exported in quantity.

From the point of view of proper fire control instruments, therefore, the moment chosen for the entry of the United States into the conflict was perhaps the worst that could have been selected.

The Committee of the Naval Board, which had been commissioned to investigate the optical resources of the country, discovered and reported substantially this situation. In his report the chairman (Mr. Baekeland) outlined the conditions which he had found and recommended to the consideration of the Navy Department that the whole matter be placed in the hands of the Bureau of Standards, which, in his opinion, was in the best position to take up the question intelligently and to propose an effective solution.

The next active step to provide a supply of optical glass was taken by the National Research Council in April, 1917, a few days

* Presented at a joint meeting of the Section of Physics and Chemistry, Franklin Institute and the Philadelphia Section, American Chemical Society.

after our declaration of war. The speaker was delegated by this body to make a personal canvass of the possible resources of the country, visiting all who were known to have knowledge of the manufacture of optical glass, and to report with recommendations.

This inquiry developed the fact, contrary to the news items on the subject which had begun to appear rather frequently in the papers, that optical glass in small quantities had been made in this country long before the year 1917. It is to the credit of the elder Macbeth, of the Macbeth-Evans Company, that the first attempt to manufacture in this country glass of high optical quality was undertaken in the early nineties and a number of creditable lenses, some of considerable size, stand as monuments to the success of this effort. Nevertheless the undertaking was financially unprofitable and the enterprise was abandoned after a short time. In 1912 the Bausch & Lomb Company, who were the largest manufacturers of instruments of precision in the United States, determined to control their own glass supply, and with the aid of a Belgian expert began making optical glass in their plant at Rochester. A factory fire soon afterward consumed the building and some delay occurred, but in 1914 very creditable samples of optical glass were produced in this plant. Because of the demands of the great war this industry flourished and the initial small pot furnace was soon replaced by other larger ones, and at the period when this record begins (March, 1917) this company was engaged upon large contracts for field glasses for the Canadian Government and for the British Field Service, in which the glass used was in part, at least, of American manufacture. The total output of this plant which might be considered available for American use at this critical moment was perhaps as much as 2000 pounds per month, a quantity sufficient in their expert hands for a considerable number of optical instruments.

It is also a matter of record in the annual report of the Director of the Bureau of Standards, dated June 30, 1915, that the possibility of our being drawn into the European conflict had been foreseen and the consequent possibility of our being suddenly called upon to provide an independent supply of glass of optical quality had been considered there. Some time during this year a small furnace was erected at the Bureau Laboratory in Pittsburgh, in which

a number of pioneer essays in this field were attempted. Chief among these was the effort to provide a suitable container or melting pot in which the glass could be melted without contamination. The clay which had been used in glass melting for most commercial purposes in this country before the war was also of foreign origin, and when this supply was cut off American pot makers found themselves without competent knowledge of American clays which might be substituted for the imported clay. The records of the United States Geological Survey show that clays are found in this country in greater quantity and variety than in any of the European countries, but in the absence of adequate knowledge of how to use them, the chance of developing suitable melting pots from American clays was not encouraging. The Bureau of Standards made a serious effort in the years 1915 and 1916 to meet this situation, but it happens that a glass-melting pot of suitable size for this purpose requires for making and burning a period of about four months, so that the development of the necessary experience proceeded slowly.

At the time when our situation was most critical (March, 1917) the experimental work of the Bureau of Standards had not proceeded far enough to be of great assistance. Their experimental work with pots was not finished and only one type of optical glass (a borosilicate crown) had been successfully made.

During this period also, and more or less in collaboration with the Bureau of Standards, Mr. Carl Keuffel, of the firm of Keuffel & Esser, had erected at the works of his company in Hoboken a small furnace in which also a successful attempt had been made to produce this type of glass, using pots of his own design and manufacture.

In the year 1916 the Spencer Lens Company, of Buffalo, erected a small plant at Hamburg, N. Y., and also began the manufacture of optical glass with a view to replace the foreign sources of supply already closed by the war. The capacity of the plant, as operated during the late months of 1916 and early 1917, was not above 200 pounds per month, and actual production was considerably less than this, being uncertain both in quantity and quality.

The chemist of the Hazel-Atlas Company, Washington, Pa., Mr. Duval, who was also reputed to have been a successful maker of optical glass in Europe in earlier

years, had already set up an extemporized furnace in this country and had melted a single pot of glass of such quality as to win favorable consideration from a firm as exacting in its requirements as the John A. Brashear Company, of Pittsburgh.

It also appeared that in 1915 the Pittsburgh Plate Glass Company, at its plant in Charleroi, Pa., had begun making considerable quantities of spectacle glass and other high grade special glasses not particularly intended for optical instruments, but nevertheless of excellent commercial quality. Incidentally, this plant proved to be the largest in the United States which might be deemed immediately available for the production of optical glass, and if it should be possible to improve the quality up to the standards of the army and navy, might contribute much to relieve the immediate need.

This then was the situation at the period of our entry into the war. One firm was regularly producing glass of fair optical quality at the rate of perhaps 2000 pounds per month. There was another plant of much larger capacity which might be deemed available, but which had never produced glass of strictly optical quality, and four others, including the Bureau of Standards Laboratory, all of which were very small and still in the experimental stage.

The estimated requirements of the army and navy, as forecast by the General Munitions Board in the month of April, 1917, amounted roughly to 2000 pounds per day.

There were very earnest conferences in the National Research Council following upon this discovery before a course of action was determined upon. Finally it was decided to ask the president of the Carnegie Institution of Washington to allow the resources of the Geophysical Laboratory, both in men and apparatus, to be applied to this overwhelming task. The obvious reason for this was, not that optical glass had ever been made there, but that at the Geophysical Laboratory there was available a larger and more experienced group of silicate chemists than perhaps could be found elsewhere. This permission was granted by authority of the Executive Committee of the Institution upon the 18th of April, 1917, twelve days after the declaration of war. From that time until the conclusion of the armistice on November 11, 1918, practically all of the resources of the Laboratory were placed at the disposal

of the Government without expense to it either direct or indirect.

Upon the assumption by the Laboratory of this responsibility several steps were taken immediately:

(1) To initiate a canvass through the United States Geological Survey to discover a source of supply of sand of the highest possible quality.

(2) By a canvass of chemical manufacturing establishments to discover a source of potash with which to supply this indispensable ingredient which hitherto had been regularly imported from abroad.

(3) To delegate a group of men to make analyses of typical glass of foreign manufacture with a view to determining the ingredients used and the relation between chemical composition and optical properties.

(4) To delegate a group of men to aid the Bausch & Lomb Company in the development of new varieties of glasses which might be needed and in securing greater perfection of quality in those already made.

(5) To canvass the manufacturers of melting pots throughout the country and to make a careful examination of the iron content of these pots with a view to guarding against contamination of the glass melt by iron, for it is a well-known fact that of all the substances regularly present in optical glasses, iron is the one which most diminishes transparency and is also the one most difficult to eliminate.

The results of this canvass will be advertised to in a moment.

After the organization of the General Munitions Board, of which Mr. F. A. Scott, of Cleveland, was the first chairman, the question of an optical glass supply was felt to be very acute. A number of sessions were held and eventually a committee was appointed (May, 1917) to give continuous attention to the task. The committee consisted of Professor Millikan, of the University of Chicago, chairman; Mr. Stratton, of the Bureau of Standards, and the present speaker.

After the canvass of the situation, which has been outlined above, it appeared clear that all of the sources of optical glass available in May, 1917, could together produce only about half of the quantity required, assuming that all of the glass produced was quality suitable for war equipment. At that time the Bausch & Lomb Company alone were producing glass of such quality. Moreover, it was estimated

that they might, by extending their plant, carry approximately one-half of the war load. To maintain the other half there appeared to be but a single course open, namely, in some manner to make the Charleroi plant of the Pittsburgh Plate Glass Company available and to place some one in charge of it who should have sufficient knowledge of the requirements and technique to raise the quality of glass produced there to the standard which the Government required and which they had not hitherto attained alone.

After several conferences a plan was agreed upon whereby the Pittsburgh Company should undertake to perfect their glass under the direction of the Bureau of Standards Laboratory, located nearby. It appeared to the committee that such an arrangement might work out advantageously, for the chemists of the Geophysical Laboratory were already in charge at Rochester and a gentle rivalry between the two institutions might prove an incentive to each, of a kind which might bring results more rapidly than without such an arrangement. In addition to this the Bureau of Standards had received through the Naval Board the sum of \$75,000 for the extension of its own plant in Pittsburgh, and it was thought that with this organization thus strengthened and given control of the facilities at Charleroi, the other half of the war production would be attained.

In practice there was some disappointment in carrying out this plan. At the close of the year 1917 Bausch & Lomb Company was producing in Rochester at the rate of about 40,000 pounds per month, while the Pittsburgh Plate Glass Company had not been able in the eight months interval to provide any glass which would pass the Government inspection standards.

At that time Mr. Raymond, General Manager of the Pittsburgh Company, decided that the basis upon which they were producing was not destined to prove successful, and application was made to the Geophysical Laboratory to divide its force at Rochester and to permit a number of the chemists who had been successful there to take up the Pittsburgh problem. This was practically laying the entire load upon the Geophysical Laboratory, because only one month previous (December 4, 1917) the Laboratory had taken the responsibility for production in the third of the optical plants, that of the Spencer Lens Company, of Buffalo, and every man of its force was

occupied to the limit of his capacity. Indeed the requirements at that time were so pressing that there was need to strain the situation to the breaking point if necessary in order to secure the maximum producing capacity out of every available furnace. Dr. J. C. Hostetter, of the Geophysical Laboratory staff at Rochester, with three associates, Drs. Adams, Williamson, and Mr. Roberts, from the Washington Laboratory, and Dr. Taylor, of the Bureau of Standards Laboratory, by invitation, undertook this most difficult problem, beginning on January 1, 1918. Dr. Bowen was soon after detached from the Spencer Lens Company plant and added to this group.

Speaking at this distance of the situation which then confronted us, it is perhaps not unfair to say that we would have done more wisely to have further enlarged the plan at Buffalo or at Rochester, or both, to the size required to produce the glass needed rather than to attempt the immense problem which the Charleroi plant presented. Sixteen furnaces were available which had already been used for glass-making, and others which might be turned to the task should circumstances require, but all of the furnaces were of an old type without regeneration and without means for controlling the temperature in individual furnaces within 100 degrees centigrade, whereas it was already established by our experience at Rochester that a control as close as five degrees must be continuously maintained in each individual furnace to insure success.

The Pittsburgh Company was liberal in its plans and the Government placed a large contract, amounting to 100,000 pounds, with the company in order to afford an incentive to press forward as rapidly as possible the improvements which were needed. Certain specified improvements were even authorized to be charged against cost of the glass delivered. Nevertheless production lagged, and it was not until the following July that the output contemplated in the original plan was attained. In the intervening months the average production had been from 3000 to 6000 pounds per month, which afforded a modern contribution in addition to the production elsewhere, but it amounted to scarcely 10 per cent. of the production of the Rochester plant throughout the spring months.

In contrast to this situation, and to the difficulties encountered at Charleroi, it is interesting to consider the progress of the

small plant of the Spencer Lens Company, at Buffalo, in the same interval. This plant was new and though small was capable of competent control. Accordingly production up to the existing capacity began in the month of December and continued uninterruptedly thereafter until June, 1918, when it was approximately doubled by additional building, and in August when it was doubled again. Two of the members of the staff of the Geophysical Laboratory (Drs. Fenner and Bowen) went from the Rochester plant to start this furnace, and of the first twenty-two pots which were put through after their arrival not one failed.

In the spring of 1918 the General Munitions Board was replaced by the War Industries Board, a considerably larger and more diversified body, but, like its predecessor, advisory rather than authoritative in character. Nevertheless by agreement of the Purchasing Departments of the various Ordnance Bureaus authority was placed in its hands to exercise a certain amount of supervision of contracts with a view to increasing the effectiveness of production by regulating the size of contract and time of delivery to the producing capacity of the manufacturer, and by aiding him in various ways. In particular, with respect to optical glass, the reorganization terminated the existence of the Optical Glass Committee of the General Munitions Board, and in its place provided a certain amount of direct authority over manufacturing processes. For example, in the contract for 100,000 pounds of optical glass issued to the Pittsburgh Plate Glass Company early in 1918, the specifications of the glasses and the conditions of inspection were written into the contract, together with the requirement that all of the glass to be delivered under the contract should be produced under the direct supervision of the Director of the Geophysical Laboratory, who was designated "In Charge of Optical Glass Production, War Industries Board." This arrangement had the effect of giving to the representatives of the Laboratory in the various plants over which they exercised control, absolute authority to prescribe the raw materials which should be used and the details of all the processes through which these materials were to be passed up to the time of the inspection of the finished product, which was done by authorized representatives of the Ordnance Department of the branch of the service to which the glass was consigned. The Geophysical Labora-

tory at no time exercised any authoritative control over the inspection standards or the manner of applying them.

This organization and procedure was common to all of the three large plants until the conclusion of the armistice in November, 1918, and except for a small quantity of glass manufactured in the Laboratory of the Bureau of Standards at Pittsburgh, and a still smaller quantity made by the Keuffel & Esser Company, covered all of the glass produced for war uses during this year.

Leaving now the Washington organization and its relation to the manufacturing plants, some account may properly be given of the steps taken, (1) to raise the quality of the glass to meet the inspection standards set by the Government, (2) to increase production to the magnitude required by the war needs.

Although the phrase "optical glass" has become familiar through notices printed in the papers from time to time during the progress of the war, in point of fact but little has been printed of the qualities which serve to distinguish optical glass from other glasses. In general it may be said that optical glass is the highest type of clear glass known in the art. A single illustration may serve to explain my meaning. Ordinary spectacle glass in its conventional use appears clear and white, but if it is held so as to permit looking through the glass edgewise considerable color may usually be detected, so that it might occur to one as doubtful whether it would be possible to see clearly through the same glass if the thickness were represented by the width of the glasses rather than by their shortest dimension. For optical purposes, notably in the case of prisms used in range finders and periscopes, very much greater thicknesses than this are common, and a glass for such a purpose must be optically perfect throughout its thickness, which may often reach four or five inches.

The qualities assigned for test in establishing standards of inspection for optical glass, very briefly, are these:

- (1) Homogeneity, by which is meant uniformity in chemical composition, freedom from striation, bubbles, inclusions and crystallization.
- (2) A constant refractive index and a constant dispersion ratio throughout.
- (3) Freedom from color.
- (4) High transparency.
- (5) Both physical and chemical stability,

by which is meant durability under exposure to the weather, chemical fumes, etc., as well as toughness and hardness for protection against misuse.

(6) Physical homogeneity, by which is meant freedom from strains or internal stresses caused by uneven cooling of the molten glass.

To produce glasses with these qualities the first obvious requirement is high chemical purity in all the ingredients of the glass itself and the second either an insoluble pot in which to melt it, or one in which the ingredients entering the glass from the pot shall not impair the development of the above qualities.

The search for such materials, which was immediately instituted by the Geophysical Laboratory when it was first authorized to take up the optical glass problem, yielded the following results:

After a search of the sand quarries from the State of Washington to Florida, including more than forty-five different localities, a sand was finally located at Rockwood, Mich., of which the analysis indicated greater purity than that from any known source of supply, even including in the comparison the wonderful sand of Fontainebleau (France) which has been used both in France and England for artistic glassware for a hundred years.

A number of sources of potash were canvassed, in the course of which much disappointment was experienced. Not only were the efforts, which were first put forth in this country to make potassium carbonate, less successful than might be wished, but the cost of manufacture was almost prohibitive. European potash was laid down in New York before the war at six cents per pound, while the major portion of the American-made potassium carbonate used in the manufacture of optical glass, cost the Government in the neighborhood of \$1.00 per pound. This fact is of some importance as an indication of the outlook in store for an independent optical glass industry now that the war has closed.

It is to the credit of the Armour Company, of Chicago, that the first potassium carbonate of adequate purity was produced in this country. Subsequently it was found possible to substitute the nitrate for the carbonate, either in part or altogether, and so to obtain a salt which was equally good and much more generally available. But even so, the necessary provision for potash in some of the glasses remained to haunt

us throughout our entire experience of glass manufacture without reaching an altogether satisfactory final solution. Sulphur and chlorine, one or both, were very often found, and a small percentage of either is usually sufficient to give a milky cast to the finished product.

In view of the long period of time needed (about four months) to manufacture, to dry, and to burn the pots which must contain the glass during melting, to which allusion has been made above, this investigation also was never quite satisfactorily concluded. In the beginning it was of course necessary to purchase in the open market such pots as were then available. These had not been made with a view to their use in the manufacture of glass of high purity, and in general were found to contain about one hundred times as much iron per cubic centimeter as could safely be permitted in the finished glass (2.0 per cent., compared with 0.02 per cent.). It is, therefore, a matter of easy calculation to show that, however pure may be the sand, potash, lead, and other ingredients required for a particular glass there was more than an even chance that enough of the contact surface of the pot would be dissolved in the mixture to contaminate the contents of the glass beyond the limits of tolerance. Between the iron, which diminishes transparency, and the sulphur, which even in very small quantities causes milkiness, many a pot of promising glass found its way into the Genesee River during the early days at Rochester without in any way aiding our troops at the front.

Nevertheless our pot makers, with a single exception, put forth a splendid effort to meet the situation by conducting experiments simultaneously in several plants, and it proved possible within four or five months to obtain containers in which the raw material was sufficiently free from contaminating elements so that glasses of a purity comparable with the best European glasses could be obtained. This conclusion was aided considerably by the discovery that if the pot was first burned in a furnace at a temperature considerably higher than any which would be required for melting the glass, burned even until the side walls showed signs of sagging and the surface became more or less glazed, then the solution of pot material in the glass was greatly diminished. By the use of this process, even more perhaps than through more intelligent selection of clays, it became

possible to melt nearly all of the glasses with a minimum of contamination from the pots.

Of course in the manufacture of optical glass, as opposed to other branches of the glass industry, a pot is used but once, which makes it much easier to provide means for avoiding or limiting the solution of pot material in the glass. An absolutely insoluble pot is unknown for the reason that all of the oxides which enter into glass composition, as well as the refractory oxides used about the furnace, are mutually soluble.

Toward the close of the war period the porcelain type of pot developed by Dr. Bleininger, of the Bureau of Standards, was successfully used with the glasses made in the Bureau Laboratory, but was not successfully manufactured by other pot makers in time to be of service. This pot possessed a smaller iron content and in general a lower solubility than any pot prepared for optical glass during the war period, but unfortunately could not be made generally available.

From the Laboratory point of view the most interesting problem was presented in the initial studies at the Bausch & Lomb plant, (1) of processes through which to obtain constant composition, and (2) to establish a definite relation between chemical composition and the optical constants prescribed by the requirements of the service.

In this connection it should be borne in mind that a glass solution is never in equilibrium, but is constantly changing in composition. Lead oxide and the alkalis are somewhat volatile, while the containing vessel continually contributes alumina, silica, and usually iron. It is, therefore, necessary for the student of glass melting who wishes above everything to attain to a prescribed chemical composition, to establish precise data upon the rate of evaporation at particular temperatures of those ingredients which pass out of the furnace and, at least approximately, the rate of solution of the pot in the glass. Knowing these quantities and the time of exposure necessary to mature a glass which is free from stones (that is, completely dissolved) and free from tiny bubbles, of which there is constant danger with every shift in the temperature, it is possible to produce successful pots of glass of accurately uniform composition and so to define and to reproduce definite optical constants.

The general relation between composition and optical constants is obviously the main issue in optical glass manufacture, and is therefore very conspicuous by its almost complete absence from the literature of the subject. Much of the optical glass technique has been enveloped in profound secrecy in all the three countries where it has been mainly produced, and although more or less freedom has been permitted in the publication of technical details of temperature, of stirring, and even of chemical composition, the manner of varying optical constants in any desired way through changes in composition has remained a trade secret up to the present time.

In this connection it is perhaps interesting to remark parenthetically that at the time when the French Liaison Commission visited this country after our entry into the war, to aid us with their experience in the production of war material, it was not permitted to divulge any details regarding the manufacture of optical glass upon the ground that the integrity of the existing glass monopoly in France had always been respected by the Government and must be so still, in spite of the war pressure. England adopted a similar attitude, and so in this one branch of the service the United States was left to proceed unaided to endeavor as best it might to reproduce within the period of a few months all of the experience which had been attained in optical glass manufacture since the days of Abbe and Schott in the early eighties.

It became necessary, therefore, to proceed much as a scientific man is accustomed to proceed in other unknown fields, by varying quantitatively each ingredient present and plotting the results in curves through which the effect of each ingredient on the optical constants of the resulting glass might be determined. This was done systematically and successfully, so that within a period of three months from the beginning of our efforts it became possible for Dr. Fred E. Wright, who was in charge of the work at Rochester, to write formulae for any of the typical glasses required for war service without advice from the glass expert employed there, and indeed to prepare new glasses directly from the optical specifications when needed. A special heavy flint, for example, which was desired by the Government, was made with no more than two trials. To properly appreciate just what this progress means, it may perhaps be recalled that in the days of rule-of-thumb

glass making, as many as 150 essays were necessary before a glass of predetermined optical constants resulted. This kind of knowledge applied intelligently commanded for the Laboratory worker the immediate respect and confidence of the workmen who had hitherto believed these things to be shrouded in impenetrable mystery, and contributed in no small degree to the rapid progress and co-operation obtained.

Again, later in the war, when the development of airplanes made it necessary to prepare a new type of airplane camera for battlefield photography, a special barium glass was made upon comparatively short notice which fulfilled the optical requirements with little if any variation.

Perhaps a brief digression may be permitted here to indicate the suddenness with which perplexing problems were precipitated by special inquiries like this. Most of the optical glasses in general use fall into two types, generally designated as flint and crown, both of which when melted form viscous mixtures which give little difficulty except in maintaining homogeneity. The barium crowns and flints, on the other hand, appear almost as thin as water in comparison and possess the disadvantage that they are taken up by the pots almost as rapidly as coffee is taken up by a lump of sugar. The most serious question encountered in connection with the barium glasses, therefore, was not to discover the composition appropriate to the prescribed optical constants, but to provide a suitable container in which the ingredients could be melted.

There is one other problem to which allusion should be made which is, on the whole, the most persistent and difficult problem encountered in the entire glass technique; it is the question of obtaining a homogeneous product. By this the glass-maker understands primarily freedom from striations or cords. It is fairly obvious that in a mixture, parts of which are volatile and into which other ingredients are entering through the solution of the containing vessel, inhomogeneity is constantly to be feared. Moreover, in the heavier glasses the differences of specific gravity among the ingredients amount to as much as three or four to one. These are the causes of the glass-maker's cords and striations, of which traces are found in the finest product of the glass-maker's art. It is to meet this situation that stirring is resorted to at several stages of the process.

Theoretically, if the stirring were vigorous enough, homogeneity would result except for the losses due to evaporation and the accessions (chiefly of alumina) from the pot wall; practically, this result is not so simply attained. Practically, indeed, perfect homogeneity in glass melts is unobtainable. Alumina in particular, even when present in very small quantity, yields a glass of lower refractive index than the surrounding mass and becomes immediately conspicuous. Incomplete solution of silica grains will sometimes leave a train through the mixture resembling a comet's tail. Such striations are persistent and require stirring, either constantly or at frequent intervals, not only during melting but during the cooling, in order to diminish, so far as possible, the convection currents or other migration within the melt. Even with all the precautions taken which the experience at the several factories suggested to us, rejections by Government officials were mainly on account of striations.

Toward the close of the war a new scheme of melting was developed, partly in the hope of providing a quicker process than the normal one and partly in order to render the striations innocuous by orienting them perpendicular to the plane of light transmission. This consisted in melting and stirring in very nearly the usual way, but instead of setting out the pot to be slowly cooled through a period of several days in order to be able to break it up without undue losses, the hot glass was taken from the furnace and poured upon a steel table in front of an advancing roller which rolled it out in a sheet, similar to the procedure in the manufacture of ordinary plate glass. Cooling the glass in the pots made it possible to reject the outer portions of the glass mass wherein usually the striations were found concentrated. Pouring left all of the striations in the finished product, and perhaps aggravated them somewhat, because the pouring had to be done at a temperature where the glass was by no means free from them. The results obtained by the rolling process, however, were fairly satisfactory, excepting for the most exacting requirements, because the striations were rolled out in planes parallel to the surface of the plate, so that it was possible to cut lenses from such a sheet in which the striations should all be perpendicular to the line of sight. Such glass was, in general, not well adapted for prisms or other optical forms through

which light must pass by more than one path, but for lenses, even of considerable size, it proved satisfactory.

It should be borne in mind perhaps that when glass must be produced in vast quantities for a war emergency the utmost requirements of precision may not be exacted; indeed, deliberate relaxation may become necessary. As soon as the standards arbitrarily fixed by the War and Navy Departments had been attained further efforts to improve the quality of the glass gave place to efforts to increase the quantity practically without limit. It is, therefore, not quite fair to say that the war glass produced in this country was equal to or superior to that obtainable from abroad before the war. Strictly speaking, this result was not attained, nor indeed attempted, although the technique was so far perfected that it was within the power of those who participated to produce glasses of quality equal to those made abroad when necessary. In fact, through the application of phosgene to remove the traces of iron from the sand and from the pots, it is altogether probable that greater transparency could be obtained than is usual in European glasses. It is in this quality of transparency alone that American glasses have usually fallen somewhat behind their European prototypes. A process for the employment of phosgene for this purpose was successfully developed by Lieutenant S. F. Cox in the Bausch & Lomb plant during the summer of 1918, but did not come into general use because the time required for such purification could be better spent, in the prevailing emergency, upon increased production rather than upon a superfluous refinement.

It also proved practical to carry out the entire melting process within a period of twenty-four hours. Where before the war two weeks was not an uncommon period through which to nurse the melting operation in order to secure the best results, a twenty-four hour schedule was worked out by Dr. Morey at the Spencer Lens Company's plant under which glass equal in quality to any which was supplied to the Government during the war period was produced.

In so brief an outline as this must be, it is perhaps unnecessary to consider other details of the process of optical glass-making such as the relation between rate of cooling and the break-up of the mass with a minimum of waste, the process of mould-

ing the raw blocks to suitable shape for inspection and suitable size for the subsequent operations of the lens maker, the grinding of opposite surfaces for inspection purposes and the details of the inspection process, and finally the painstaking annealing through the perfection of which alone accurate grinding becomes possible or worth while and a permanent configuration is assured. All these processes required time and conscientious attention to detail for their working out, and in general require modification for each type of glass made, but they set no problem for the chemist and physicist beyond the requirement of endless patience and attention to detail.

Of the results of these efforts it need only be said that within a period of four months after the entry of the United States into the war the production of optical glass within this country had been doubled, the methods had been rendered more effective, the number of types had been increased and, moreover, a degree of confidence had been established indispensable for the state of the times and of the task. I quote from a memorandum of Dr. Wright, written on July 28th, after three months of experience in the manufacture of optical glass at Rochester: "In the course of our work we have realized that the making of glass of high quality is not beset with mysteries to be solved only by the intuitive genius of one specially trained in the art, but that it is a straightforward scientific problem, requiring for its solution the application of methods of attack and control common to all scientific problems of high precision."

I venture to remark that before the beginning of this experience at the Bausch & Lomb plant no member of the group of men who undertook the war work there had ever followed a pot of glass through the process of melting. Moreover, with the long record of secrecy continuously maintained in two of the glass producing countries, and in the third also, except for a portion of its early history, no information was available from without. Here, as in many other cases, however, when the details are finally brought to light by time, the maintenance of secrecy has frequently been shown to be a cloak to cover limitations rather than profound knowledge. The processes of glass-making are simple and the traditions of the glass-house are as often the result of cumulative superstition as experience. The heart of the whole

matter lies in the relations between the ingredients at the various temperatures through which they pass and their reaction velocities. The solution of these relations is not a task for the glass-house, but rather for the most exacting application of silicate chemistry at high temperatures.

The Geophysical Laboratory has published freely the results of its experience in the glass industry, and in so far as this experience was not available before, it is so now for any individual or group who may wish to make a beginning of a permanent optical glass industry in this country.

The portion of my subject which deals with the future of the industry must, however, remain vague. Three firms entered this field, to produce optical glass on a large scale for war purposes, of whom two were able to make use of the product in instruments of their own manufacture. This portion of the industry may endure in whole or in part. The third successful producer of optical glass has to find his market outside his own plant, and this market is rather too intangible to be attractive as a business venture.

It remains true today, as it did during the war period, that the cost of several of the necessary ingredients is necessarily greater in this country than in European countries where similar products originate. In quality our raw materials are equally good, our experience in technique is adequate if not equally extensive with some of our European contemporaries, but the cost of potash, for example, will always lay a burden upon the American product, and other ingredients might be mentioned which fall in the same category. If there were a market sufficient to stimulate production on a very large scale these difficulties could be overcome by improved technique and organization, as in the case of other conspicuous American industries, but the demand for optical glass will probably never be large, and the incentive to large-scale processes and cheaper production will therefore probably always be lacking unless the Government determines upon a definite program of preparedness. The instrument maker may find it advantageous to make his own glass for the reason that he can then arrange for the precise optical constants which he wishes to use in his instrument, and he may have them within a period of a few days instead of weeks or months, but the trade itself will perhaps never furnish sufficient incen-

tive to build up a large industry in this country.

Moreover, if it may be said without appearing to reflect upon similar industries abroad, it is, I think, no secret that successful makers of optical glass in other countries have had to look for their profit in other lines rather than in their optical products.

In closing this account of the effort which was made to supply the Government with its indispensable requirements of optical glass, it gives me unusual pleasure to pay a personal tribute to the whole-souled patriotism and untiring patience of all members of the staff of the Geophysical Laboratory and of the participating manufacturing firms, without whose efforts this record would have been impossible. It is to them an everlasting credit that through their exertions the great, and, in many respects, unparalleled, task of developing an entirely new industry was accomplished, literally out of nothing in the way of special experience because of the atmosphere of secrecy with which this particular industry has been so persistently enshrouded. It was also accomplished in time for the requirements of the service.

The total quantity supplied by these firms from April 6, 1917, to November 11, 1918, the war period, is approximately 650,000 pounds, divided as follows:

Bausch & Lomb Optical Company, 450,000 pounds approximately.

Spencer Lens Company, 75,000 pounds, approximately.

Pittsburgh Plate Glass Company, 125,000 pounds, approximately.

In addition to this production the Bureau of Standards supplied a little more than 19,000 pounds, or about 2.8 per cent. of the total war-time production.

Except for occasional shipments of a few pounds from the Parra Mantois Company, in France; from the British Government plant at Derby, and that produced by the Keuffel & Esser Company, of New York, for their own contracts (about 9000 pounds for the period of the war), no other optical glass was available to the Government for war operations.

The right way to fit a lens into its flange, is to first turn the lens the wrong way of the thread until the two click at the point where the threads meet, then reverse the movement and the lens will enter its flange evenly.

"Chemical Eye" Device Revealed

DEVELOPMENT of a chemical eye through which rays of ordinarily invisible light could be seen and which the discoverer said would prove of great help in warfare was explained tonight by Prof. Robert W. Wood, of Johns Hopkins University, in an address before the convention of the American Association for the advancement of Science, in Chicago, on December 29. Professor Wood demonstrated a machine of his invention which produces ultra violet rays invisible to the naked eye. His audience then viewed the rays through a wide-angle telescope device which caused them to become visible and to take on a phosphorescent appearance.

Thos rays and the detecting device, were the result of the war, Professor Wood said, the government asking a group of scientists to produce a light which would be visible to those who knew of it, but would be invisible to the enemy. The discovery was made shortly after the armistice, the speaker said.

"Either airplanes, battleships or land forces could use it for signaling," he said. "Also it could be used on aviation fields for night landing of airplanes. It would point out the landing field, but would be visible only to the planes equipped with the detector. Its uses are unlimited in war."

Results of the first successful experiments on an astronomical device at the Mount Wilson, Calif., observatory, revealing that certain remote stars in the firmament are many thousand times larger in size than astronomers had ever surmised, was discussed today by Prof. A. A. Michelson, noted scientist of the University of Chicago, who perfected the device.

Under the direction of Professor Michelson, astronomical experts have just computed the diameter of Alpha Orionis, one of the stars in the constellation of Orion.

The orb is found to be 300,000,000 miles in diameter, approximately 300 times the sun's diameter. Its volume is 27,000,000 times as great as the sun.

Contact or Reduction

A GOOD deal of verbiage is expected in the discussion of the question whether it is beter to make slides or glass positives by reduction in the camera, or by contact printing, when really any practical worker will acknowledge that, as far as technique is concerned, it is no matter, one method yielding quite as excellent results as the other. So that the mode of operation is to be considered merely from the view of convenience. We have, however, frequently heard the assertion that slides made by contact are inferior to those made by reduc-

tion; but really the question turns on what the character of the negative is.

An inferior negative of a larger dimension than the intended slide, of course, is improved by reduction, because its imperfections thereby are less perceptible, but on the supposition that, other things being equal, there is no reasonable cause assignable for the superiority of one over the other. The photographer of the past, who was wont to make his own emulsion for coating transparency plates, the collodio bromide and albumen process, outward results only equaled by the gelatine-bromide when the greatest skill was exercised. Yet from the fact that these two old-time emulsions were very slow, the photographer was obliged to have recourse to contact printing for production.

Even supposing the defective negative is improved by reduction, are we not compelled to enlarge the image on the screen and so restore the imperfect state of the original? The only advantage of the one method over the other is in the direction of art, and not technique.

With camera reduction there is greater range allowed for expression of artistic manipulation. Portions of the subject may more conveniently be suppressed or other parts emphasized to the degree art demands; and if clouds should be desired, they may be better printed on by camera than by contact.

Intensification by Redevelopment

MANY negatives by reason of brief exposures are too dense in the high-lights and not sufficiently brought out in the shadows. Ordinary methods of intensification only aggravate the undesirable condition and increase the contrasts. The following method will be found to give much better relations of high-lights and shadows; in other words, a more harmonious negative:

Water	150 c.c.m.
Potassium bichromate	6.5 grams
Potassium bromide	1.5 grams
Pure nitric acid	25 minim

The negative to be treated is first placed in water until the gelatine swells up, and then transferred to the above bath, where it is allowed to bleach, keeping the plate in motion during the bleaching. It is next thoroughly washed in running water and removed to a 5 per cent. solution of metabisulphite of potash, where it remains for 10 minutes, and then once more well washed.

It is now in condition for redevelopment, which is effected in ordinary daylight.

Any ordinary constituted developer may be employed, but little if any bromide is needed in the redeveloper.

Some Historical Notes on Photography in Warfare

SINCE the conclusion of the war references have been made by many writers to the fact that although photography from aeroplanes during warfare was comparatively a new thing, photography from balloons was not, and the feat of taking photographs from a captive balloon during the siege of Paris, fifty years ago, has been made much of. Some writers have ventured a step or two further back and have stated that photographs of an enemy's movements and lines were first taken from a balloon during the American Civil War (April, 1861, to June, 1865). References to the latter photographs have, however, been either erroneous or vague, and it appears to me to be very strange that American writers have not made more of the achievement and "put us wise" as to what really happened.

In 1893, a Lieutenant Williams, writing in an American journal (unfortunately not named by the "Photographic News" of August 25, 1893, when making some quotations from it), gave some details of these early efforts, as also did Mr. W. N. Jennings when lecturing before the Photographic Society of Philadelphia on October 11th of the same year. From these two accounts one can get a fair idea of the early work that was done, work of which the most guarded statements are made by modern writers.

It was in May, 1862, that the first aerial photographs of warfare were made. The Union Army was then using a captive balloon before Richmond, and there went up in it a wet-plate worker of the name of Black, who, with his camera, endeavored to secure pictures of the enemy's forces. His first exposures, we are told, were ruined either by movement or escape of gas from the gas bag. These defects, however, were very soon overcome, and a perfect negative was secured showing the country from Richmond to Manchester on the west, and to the Chickahominy on the east (about twenty miles). The James River, the other water courses, roads, and the dispositions of troops, were all clearly depicted.

Much was made during the recent war of the use of photography for mapping out the fighting zones, of making duplicates, of numbering parts or squares marked on the maps, etc., but precisely the same kind of thing appears to have been done in 1862.

Duplicate prints were made from Black's negative, and each print was divided up into numbered squares—sixty-four of them. The General (McClellan) had one of the marked-out prints, and the other was taken aloft by the aeronaut. The latter could then telegraph what was taking place within

view, and easily designate the location of all movements, etc., to the General.

To the French must be given the credit of being the first to take photographs from balloons—Nadar doing it in the year 1858, but to the Americans must be given the credit of taking the first pictures of warfare from the air. Nadar also, I believe, took some of the pictures showing the famous siege of 1870-1, but it was the microphotographic work done during the four months' investment by the Germans which was the more important, but the balloon played no part in the making of these small positives.

These small pictures—a novel kind of warfare photography—made possible a method by which long despatches could be sent by pigeon post with great facility. The system was worked out, not by Nadar, as is sometimes stated, but by M. Dagron, who was one of the very first—if not actually the first—to produce photographs of minute size, such as are commonly associated with the tiny lens in souvenir penholders and cheap articles of jewelry. One hears little of this branch of work today, though the late Mr. J. I. Pigg took a particular interest in it, and at the time of his death was engaged working out some new ideas concerning it.

M. Dagron turned his microphotographs to good account on behalf of those shut up in Paris, reproducing all kinds of printed matter on a pellicular substance, of which collodion was, no doubt, the base, and posting copies so produced rolled up in a quill attached to a pigeon's tail. Each little pellicule would contain the reproduction of about sixteen pages of printed matter, and eighteen of such pellicules, weighing a little less than one gramme, were usually entrusted to one bird.

The usefulness of photography in mapping out the enemy's lines from the air, and a special balloon-supported camera for doing the work, appears to have been brought to the attention of our own War Office in the year 1877, when, of course, the officials rejected it. It was the invention of Mr. W. Woodbury, and consisted of a specially-made camera—attached to a gas balloon eight feet high—with plates set on a horizontal revolving disc, the whole being "worked" by means of electric wires woven into the rope which held the balloon captive.

Balloon photography, however, never attracted the amount of attention it appeared to deserve, and far more thought seems to have been given to kite photography, M. Batut, of France (in 1887), being the first of the many experimentalists whose kite work was interrupted by the coming of aeroplanes and navigable balloons or airships.—*The British Journal*.

Reduction with Ammonium Persulphate

HOWEVER carefully a photographer may work, there are many instances in which it is difficult to secure the degree of softness in gradation that is desirable. The subject may be harsh in character, or it may be difficult to give sufficient exposure to secure softness, and it is in such cases as these that the value of such a reducer as ammonium persulphate is felt. Harshness in the negative may be removed and softness in the balance of tone substituted.

By adopting the formula and method of working here given, full advantage may be taken of the valuable qualities possessed by ammonium persulphate. And the disadvantages and risks which usually accompany its use are entirely removed. A stock solution should be prepared:

Ammonium Persulphate..	1 oz.	50 gms.
Sodium Sulphite.....	90 gr.	10 gms.
Sulphuric Acid.....	45 min.	5 c.c.
Water to make.....	9¼ oz.	500 c.c.

This forms a 10 per cent. solution of ammonium persulphate, which will keep indefinitely in a well-stoppered bottle.

For use the solution requires diluting, the strength varying with the plate. With many plates on the market the working solution will consist of one part of the stock solution to nine parts of water; containing, consequently, 1 per cent. of ammonium persulphate. With some negatives, mostly those in which the gelatine is very hard, a stronger bath may be necessary. One part of the stock solution may be taken to three or four parts of water, forming a 2 or 2½ per cent. solution of ammonium persulphate. The weaker bath should be used when practicable. Some negatives respond readily; others are not nearly so amenable to treatment. Where difficulty is experienced the negative may be immersed for a few minutes in a dilute ammonia bath, about one part of strong ammonia to eighty or one hundred of water. It should then be well washed before reduction is attempted. In any case it is desirable that the negative should be soaked in water for some time before reducing.

To reduce density the negative is immersed in the diluted persulphate solution and the dish rocked. Soon after the negative is placed in the solution a milkiness is seen flowing from the denser portions, and this is an indication that the solution is working satisfactorily. The action is continued until it is sufficiently reduced, when the negative is removed from the solution, washed rapidly in two changes of water and placed in a plain solution of hypo or an ordinary fixing bath for about ten minutes. It is then well washed in the usual manner and dried.—*Photo Notes.*

Combination Prints

The photographer is often faced with the problem of inserting an extra figure in a group or adding a landscape background to a figure taken indoors or among unsuitable surroundings. The method usually adopted is to make prints from the figure and background negatives, enlarging or reducing if necessary so as to obtain the proper proportions, then carefully to cut out the figure and mount it in the desired position upon the background, afterwards making a negative from the "paste-up." There is, however, a means of simplifying the operation by which time and labor may be saved and the expense of a mount avoided. It consists of superposing the cut-out figure and background under water and squeegeeing the face of the prints into contact with a piece of good clear glass, which is then set up before the camera in the usual way. By following this procedure a perfectly homogeneous surface is obtained, and the edge of the cut-out portion is rendered almost invisible. If the squeegee be applied firmly and the paper has been well soaked the figure will be almost embedded in the background. After the negative has been secured the prints may be separated from the glass and either dried and preserved for future use or, if not likely to be needed again, thrown away.

A reception was given on January 8, 1921, by The Camera Club, New York, to Dr. Dwight L. Elmendorf, the well-known traveller and lecturer, who is one of the oldest members of that Club. Dr. Elmendorf gave a lecture entitled, "Fifty Years Behind the Camera," and illustrated it by numerous slides from negatives made in different parts of the world, some of them dating to the early period of 1872. The lecture was followed by the annual Club dinner.

The installation of officers of the Professional Photographers Club of New York, Inc., and presentation of a gift of appreciation to the Treasurer, B. Bromberg, took place on Wednesday, January 5, 1921.

All the officers of the past year were unanimously re-elected—J. Goodman, President; J. Waterman, Vice-President; B. Bromberg, Treasurer; E. Chait, Secretary.

B. Bromberg was presented with a very artistic lamp in appreciation of his services as officer and active member.

A very interesting discussion was begun by Mr. Waterman, which brought out an excellent discourse by our Ex-President, W. B. Stage, on "Individuality in the Practice of Photography" as a profession and as a business; practical advice that appealed to all present and was greatly applauded.

E. CHAIT, Secretary.

Photographic Materials and Processes

Photographic sensitizers; Studies on —.

II. *The carbocyanines.* W. H. Mills and W. J. Pope. *Phot. J.*, 1920, 60, 253–266.

THE carbocyanines are produced by the condensation of 2 mols. of a quinaldine alkyl iodide with 1 mol. of formaldehyde under the influence of alkalis. The formula adopted for the class assumes the linkage :CH:CH:CH. between the two quinaldine residues, attached at the 2 position in each case, thus: N(R).C₆H₄:CH:CH:CH.C₆H₄N.R.X, the simplest member being the 1.1'-dimethyl compound. Sensitol Red (German, Pinacyanol) is 1.1'-diethyl-carbocyanine iodide, and is, so far, the most important dye of the class. Eighteen members of the series are described both as to their chemical properties and as to their sensitizing as determined by the method previously described (J., 1920, 468A). The change from the 1.1'-dimethyl to the 1.1'-diethyl compound is accompanied by a considerable increase in sensitizing action; further increase in the weight of the substituent groups in these positions results in a steady decrease of sensitizing action. The effect of introducing substituent groups in other positions in the molecule varies with the nature of the group and the position. Generally speaking there is a reduction of sensitizing action as compared with the 1.1'-compound, which increases with the size of the substituting groups. Substitution in the 6-6' positions has a slight reducing effect, in the 5-5' positions a strong reducing effect. It is suggested that the distinguishing characteristic of the carbocyanines as compared with the isocyanines (*loc. cit.*) and on which the extension of their sensitizing action into the far red depends is not the position of attachment to the quinaldine residues, but the presence of the linkage :CH:CH:CH. instead of :CH.

Neutral-wedge photometer; New —, for sensitometry for photographic copying processes, and scientific light-measurement. J. M. Eder. *Phot. Korrr.*, 1919, 56, 244–271.

THIS is an adaptation of a Goldberg neutral wedge in combination with a special form of millimetre scale. In one form a wedge 9 x 12 cm. is used having a constant of 0.40137 per cm. and being provided also with color strips, red, yellow, green, and blue, for the testing of chromatic and panchromatic plates; another form is 16 x 3 cm. with a constant of 0.30484 per cm., this being chiefly intended for actinometric and similar work. The use of wedges in sensitometry, in photometry, and in actinometry is described and tables are given showing the relative proportions of light

absorbed at all points of the wedge, comparing the wedge scale readings with Scheiner scale numbers, giving comparative results obtained by the wedge with Hefner and electric light for speeds of ordinary and color-sensitive plates, etc. There is also a comparison of the various types of actinometer papers which may be used.

Eder-Hecht neutral-wedge photometer for sensitometry and light-measurement. II. Magnesium as a secondary standard light source. J. M. Eder. *Phot. Korrr.*, 1920, 57, 1–9, 41–44, 83–86.

THE use of magnesium light as a secondary standard light source is advantageous by reason of its simplicity and its approximation, in color value, to average daylight. A suitable unit is 2 mg. at a distance of 3 m., which is approximately equivalent to a Hefner-candle-metre-minute. The magnesium, about 3 mm. of ordinary ribbon, is held on the point of a steel needle at the correct distance from the plate to be exposed. The use of the Eder-Hecht photometer (*cf. supra*) with magnesium as the light source is fully described, comparative results with the Hefner lamp for various plates being given as well as sundry tabulated constants of the wedge. A full scheme for testing and evaluating plates and papers with the aid of the wedge is described and also the use of the wedge for evaluating exposures in light-therapy.

Paper as Substitute for Glass

PAPER negatives are not new. The older photographers remember them well, but like coffee, dry-plates, tin-types and many other expedients in the photography, they have been relegated to the limbo of forgotten things. Lately, however, owing to the very high cost of glass in Germany, two prominent German firms have placed on sale a special form of paper negative. The *Photographische Rundschau* describes the product, and the issue carries two advertisements of it. The *Farbenfabriken Friedr. Bayer & Co.* advertises under the trade name of "Plattenfort," a negative paper, orthochromatic and highly sensitive, suitable for landscape and instantaneous work. Metallic frames, enameled with black, are provided as supports for the negative and fit in the ordinary dark slide. Exposure and development are made as with glass negatives. Owing to the opacity of the paper, the degree of development is not so easily judged as with glass, but it is claimed that this difficulty is soon overcome by experience. Development usually takes about five minutes. After fixing, washing and drying, the film is removed from the paper. The attachment of the film to the paper is made in such a way that simply pulling up

one corner enables the whole extent to be drawn off, the operation being materially aided by the fact that the film, which is of gelatin, is fairly firm, and if fixed in an alum bath, is further hardened. The film can be used then as a negative. One advantage over glass negatives is that in pigment printing, such as carbon work, the film can be reversed, thus avoiding the duplicate treatment that is usual.

The other factory furnishes a plate of somewhat similar character, but the separation of the gelatin from the paper support is accomplished by cutting a bevel along the edges, so that the film extends a little beyond the paper base, when it can be easily removed. The advertisement of the first mentioned firm claims the new form as "light, unbreakable, free from halation and capable of being copied from either side," in addition to being orthochromatic and very sensitive.

Mixed Developers

H. BORGEE (*Photo-Revue*) discusses in an interesting manner the use of developing solutions containing two active substances, referring especially to the familiar metol-hydroquinone solution. After briefly noting the early history of dry-plate development, beginning with the iron oxalate and the pyro-ammonia, he notes the introduction of hydroquinone, which being active and capable of being used alone in a solution of good keeping qualities, was taken up with great pleasure, as all the older amateurs will recall, but disappointment followed. The fresh solution is liable to fog, and hence it was necessary to employ a ripened one, or to add bromide. Even then, the negatives were hard and dense. The vogue of hydroquinone was, therefore, short, and the amateurs turned with enthusiasm to the other organic developers that were in rapid succession placed on the market. Eikonogen and metol were in turn favorites. It was found that the latter gave negatives free from veiling and showing good detail, but lacking in body, and giving unsatisfactory prints.

The idea then was suggested of combining the two types of developers, and thus was originated the metol-hydroquinone combination now so widely used. Other combinations, such as pyro-metol and eikonogen-hydroquinone were introduced. Borgée objects to the metol-hydroquinone association in that it lacks easy adaptability. Different proportions of the two ingredients are required for different types of sensitive emulsions, so that solutions for use with bromo-chloride papers contain from 4 to 5 parts of hydroquinone to 1 of metol, while with gelatin-bromid papers the proportion of the hydroquinone is much lower.

The ideal developing solution will be one in which one ingredient acts rapidly, producing an image without marked contrast, and another much slower, which begins to act only after a notable degree of development of the image by the more active agent has occurred. The general increase of density and the production of desired contrast will be obtained. To secure this arrangement, Borgée employs a mixture of metol and glycin. He presents in parallel columns the relation of the actions of these substances, of which the following is an abstract:

METOL

Develops in 4 to 5 minutes.

Image appears in 10 to 15 seconds.

Development soft, and but slightly sensitive to bromide.

GLYCIN

Develops in 10 minutes.

Image appears in from a minute and a half to two minutes.

Development soft or hard, according to the concentration, and sensitive to bromide.

Theoretically, a combination of these two will be expected to act by the metol bringing out the whole image without contrast, and later the glycin will develop the contrast and increase the density. Practically it can hardly be expected that so perfect a specialism of function will occur, for, in accordance with the well-known principles of chemical action, the development of the image by the metol will cause the action of the glycin to be somewhat different from that which will occur when it acts alone. To control the actions some bromide will be needed. From these considerations the following formula is proposed:

Warm, boiled water...	1000 c.c. (1 qt.)
Metol	2 gm. (30 gr.)
Sod. Sulph. Anhydrous	11 gm. (160 gr.)
Potassium Carbonate..	10 gm. (150 gr.)
Sod. Carb., Anhydrous	10 gm. (150 gr.)
Glycin	6 gm. (90 gr.)
Pot. Brom. (10% sol.)	2.5 c.c. (50 dps.)

A plate normally exposed will be developed in this solution in about five minutes, which shows that the action of the glycin has been hastened by its association with the metol. In the first stage of action the image appears in its entirety. It is weak, but soon strengthens, and, if the action is continued for about seven minutes, it will become decidedly hard.

It is claimed that the solution is especially satisfactory for films, and has wide application without changing the proportion, being also tolerant of considerable range of exposure. The applicability of a mixture of glycin and paraminophenol is discussed, but solutions of the latter ingredient are troublesome to prepare, requiring the use of caustic alkalis.

A Method of Developing Highly Sensitive and Panchromatic Plates by Ordinary Light

Dr. Lüpbo-Cramer describes in the Swiss journal *Die Photographie*, the following method by which plates that are usually developed in special safe-light may be developed without danger of fog in ordinary light. He found, in the course of studies on sensitizing plates, that the safranin dyes possess the property of diminishing sensibility of silver bromide in a remarkable degree. If, to one of the ordinary developers, a very dilute solution of phenosafranin (1 to 2000) is added in the proportion of 10 c.c. of the color solution to 100 c.c. of the developer, and the plate allowed to remain for about a minute in the mixture, the development may be then continued in bright yellow light. The plate can be lifted out of the liquid in order to examine the condition of the image, inasmuch as the action of the color is not merely that of a protecting screen, but a deep chemical or physical change in the silver bromide. Lüpbo-Cramer states that it is possible to conduct the development in such a way that a special dark-room illumination is not needed. The plate is immersed in total darkness in the color solution for about a minute, and then placed in the developer. Just before this transfer, a stearin candle, placed at a distance of six feet from the plate, is lighted. In this convenient illumination the development of even very sensitive panchromatic plates may be carried out without any danger of fog. Even the liability to chemical fog on the part of the plates sensitized with isocyanin is avoided by the method.—*Photographische Rundschau*.

Photography Through Turbid Media

PROFESSOR SCHEFFEL, observing a landscape through a yellow or a red filter, found that the background was clearer than when examined by the naked eye, and, further, that the opposite effect was noted when using a blue filter. In his studies, Scheffel used also a gelatin film rendered turbid by precipitated barium sulphate, and discovered that light rays of long wavelength are transmitted better through such media. Persons whose eyes are affected with mild turbidity distinguish objects better in red light than in white. This may, however, be connected with action on the iris. It has long been known that in the early stages of cataract, the patient may see better in the dusk than in full daylight, but this is due often to the wider opening of the pupil which uncovers some portion of the still clear lens.—*Il Corriere Fotografico*.

To Obtain Green Tones

A number of inquiries having come to us of late in regard to obtaining green tones on Cyko, we reprint this month a formula for green tones published in *Portrait* several years ago. It has been worked successfully in connection with Cyko in our own print department, and various Cyko users have told us that it gives the green tones they want. Three solutions are required, as follows:

SOLUTION A.

Potassium ferricyanide 5 grams or 77 grains
Ammonia 5 drops
Water 100 c. c. or 3½ ounces

SOLUTION B.

Concentrated ferric chloride 5 c. c. or 80 min.
Water 100 c. c. or 3½ ounces

Or, if ferric chloride is not at hand, one can use:

Ferric ammonium citrate 2 grams or 33 grains
Hydrochloric acid 5 c. c. or 80 min.
Water 100 c. c. or 3½ ounces

SOLUTION C.

Sodium sulphide ... 1 gram or 15.5 grains
Water 100 c. c. or 3½ ounces
Then add hydrochloric acid 5 c. c. or 80 min.

This solution may become turbid, but no attention need be paid to that. The toning is done as follows: The print, after washing, is placed in Solution A until bleached through to a light brown. This usually takes from two to three minutes. The solution is now poured back into the bottle and the print washed until the whites are free from the yellow color of the ferricyanide. Upon the thoroughness of this washing the ultimate purity of the whites depends. After washing, the print is placed in Solution B for five minutes, then rinsed once or twice and transferred to Solution C for five minutes.

A short washing completes the process. Should the whites of the print appear tinted pale blue while it is wet there need be no cause for alarm, as the discoloration practically disappears after drying.

Rapid Fixing Bath

Il Corriere Fotografico recommends a bath composed of

Water 1000 c.c. (1 qt.)
Ammon. Chloride. 75 gm. (2.5 oz. avoird.)
Hypo 113 gm. (4 oz. avoird.)

For use, dilute a measured portion with nine time its volume of water. It is stated that if 2 per cent. of sodium bisulphite is added the fixing capacity is somewhat diminished, and that the addition of 2 per cent. of potassium alum overcomes to a certain extent this antagonism of the sulphite.

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UTILIZING REFLECTIONS IN PICTORIAL WORK—WILLIAM S. DAVIS

THE value of reflections in increasing the pictorial effectiveness of many subjects is often a surprise to one who has not given the matter attention, for the variations of tone and line introduced not infrequently transforms a commonplace scene of naturally monotonous tones into material which will yield a composition full of sparkle and elusive tonal gradation. In fact, reflections can, on occasion, be used as *the theme*, instead of simply being an accessory to it.

Before going further along this line, however, it may be well to stop long enough to define the difference between reflections and shadows, as the two terms are sometimes used almost interchangeably, as though they applied to the same things, which is not by any means true.

When an object is in shadow, or casts a shadow upon any surface, such a condition is brought about by a reduction of illumination of the part in shadow; as when we see one side of a house in shadow, or a building cuts off a part of the light from the surrounding ground, causing a cast-shadow upon the surface of the latter, varying in size and shape with the size of the object and height of the source of light. A cast-shadow is in the nature of a flat tone laid over the material it falls upon, and partakes of the color of the latter rather than that of the object casting it.

Reflections differ fundamentally from shadows by exhibiting more or less perfectly the same colors and gradations of tone as the objects reflected; consequently are never flat in tone unless the objects are.

Reflections and shadows often occur together, even to the extent of a cast-shadow being projected across the surface of a reflection under certain conditions. The latter, when it occurs, is due to the fact that a shadow is cast in

the opposite direction from the source of light, while the location of a reflection in relation to that of an object is dependent upon the angle of the reflecting-surface, independently of the angle of illumination. In a scene containing still water the reflections always fall toward the spectator, but if the objects producing them are brightly lighted from one side they will cast shadows across the field of vision at right angles to the direction of the reflections.

Water, ice, glass, and polished surfaces of any kind, all transmit reflections more or less distinctly, depending upon their smoothness or polish and the brilliancy with which the material causing them is illuminated.

Lighter tones, as a rule, are reflected more strongly than darker ones, this being especially noticeable when reflections fall upon a broken surface. On water, whose surface is broken into wavelets, a high-light, like the sun or a white sail in sunshine, will be reflected when the darker tones of any object will make little or no impression. This is also true of reflections upon a dark surface, such as a polished table-top of dark wood; the darker portions of the subject being almost lost, while the lightest parts are clearly seen in the reflection—a fact due to the tonality of the reflecting surface being nearer in value to the dark tones of the subject than they are to the light ones. Whatever the surface, one invariable rule is that a reflected high-light cannot be stronger, or higher in key, than its source. As a matter of fact it is at best a trifle less bright and usually much less brilliant than the surface producing it. This fact should be remembered when the question of relative values comes up in picture making. It is possible, however, for the highest light in a picture to occur in a reflection when



"A STUDY IN REFLECTIONS." WILLIAM S. DAVIS



"WAITING." BEN V. MATTHEWS



"WHAT'S THE JOKE?" BEN V. MATTHEWS

the light which produced it is excluded from the composition, as when a sunshine effect upon water is shown without including the sun.

The relative depth of the darker tones in a reflection, as compared with their source, varies a good deal according to the tonality and clearness of the reflecting surface, so it is hardly safe to do more than indicate in a general way what may be expected. If reflections fall on a dark, highly polished surface, or one is looking into deep clear water (rather than along the surface at a low angle), the reflection of a dark object may appear deeper in tone than the original, but when the reflecting surface is light in tone, somewhat dull, or consists of shallow, muddy water, the result is likely to be reversed—the reflection being rather lighter than the dark tones of the original. If a reflection comes from shallow water in the immediate foreground, the nature of the bottom will affect the tone of the reflection, since when looking down through the surface of the water one can see to a certain extent the tone of the bottom, and this mingles with those of the reflections.

The practical conclusions to be drawn from the foregoing is that reflections cannot show greater range of contrast than the original, and owing to a reduction in perfection of the reflecting surface, due to such causes as those just



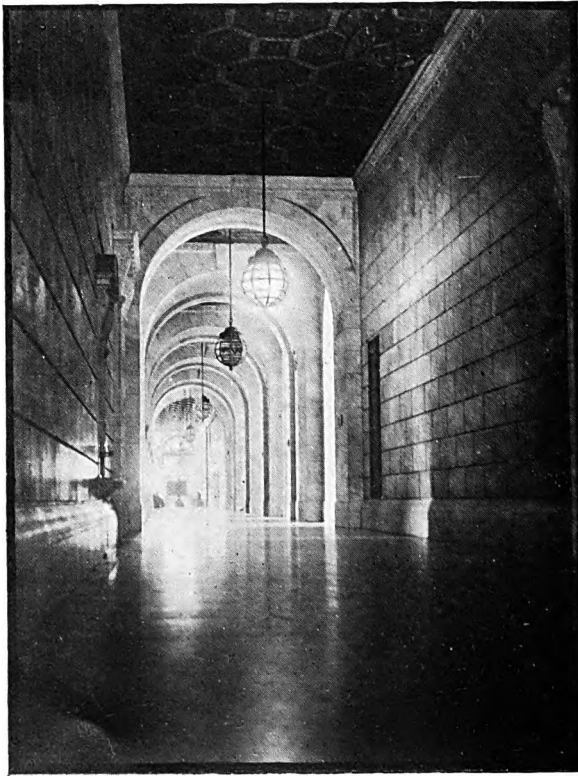
"AFTER THE RAIN." WILLIAM S. DAVIS

mentioned, are generally less sharp and brilliant in tone than the scale of contrasts found in the objects they come from. In rendering them pictorially it is well they should be represented as less clear in tone and detail than the solid objects in the composition, since this makes for greater harmony of effect.

Probably the greatest pictorial value of reflections lie in the possibilities they afford for transforming an otherwise flat, monotonous, foreground into a feature of interest and beauty, filled with attractive tonal effects and soft detail. Next to this comes the utilization of reflections to balance other parts of a composition, either by a reversed repetition of lines and masses, or the introduction of light tones where needed.

When reflections can be made an important feature, one must decide at once whether they shall be used as the dominant feature of the picture, or accessory to the other material, for equal spacing between objects and reflections cannot fail to create a division of interest instead of helping to pull the composition together.

Our illustrations are intended to bring out some of the points mentioned. In the one called "After the Rain," the puddle left in a country lane is simply used as a valuable accessory to introduce some varied tones where there would



"REFLECTIONS"—NEW YORK PUBLIC LIBRARY
© WILLIAM S. DAVIS

otherwise have been an unbroken expanse of dark, muddy road for a foreground. It also leads the eye into the picture in a pleasing manner, and balances, by partial tone-repetition, the light area of the sky.

The next, "A Study in Reflections" (which was made immediately after the first illustration), features the reflections of the wayside trees. To do this without a clash of interest, the skyline was kept high enough to cut off a large portion of the objects in the middle distance and distance which are seen in "After the Rain." In this way it was possible to let the reflections show a considerable amount of material, the source of which lay outside the upper margin of the picture. The portions of bare ground visible at the right, and through the middle of the road, help give a feeling of perspective and flatness to the surface of the water, which is, of course, necessary to prevent it appearing to slant upward.

Our third subject—"Reflections—N. Y. Public Library"—is of an entirely different character, and suggests some of the effects which may be seen upon polished surfaces in an interior. In this case the lighting was a combination of daylight and electricity, the latter coming from lanterns suspended from the high ceiling, and as the floor and walls of the hall are highly polished colored marble, they made excellent reflecting surfaces.

Many times reflections less prominent than those in the subjects illustrated make just as important a contribution to the effect of a composition as a whole. In a marine, for instance, showing wharves and shipping, slight ripples in the water break the sharpness of the reflections into interesting wavering lines, admirably calculated to lead the eye up to the objects casting them, when a perfectly clear inverted image would be likely to divert attention.

To preserve the feeling of flatness in the surface reflecting an object it is very necessary to avoid the hardness which comes from under-exposure, since this destroys surface textures.

NATURAL COLOR PHOTOGRAPHY

PHOTOGRAPHY, strictly speaking, is a reproduction of nature in monochrome.

We all know that the salts of silver used, whether used for direct printing-out, or for getting what is called the "latent image," and its subsequent presentation by development yield impressions in monochrome more or less black images, and never by ordinary processes give things in the color of nature. Yet it is possible by certain procedures to get color closely approximating those of actual things—the colors of the solar spectrum, for instance.

Before the real discovery of practical photography by Daguerre in 1839, Seebeck, in 1810, did get a fairly accurate reproduction of the spectrum on silver chloride.

He rigged up a contrivance by which he kept the image of the solar spectrum in a fixed position, projected upon a moist chloride of silver paper for 30 minutes and found that in the violet band the image was reddish purple,

sometimes more violet, sometimes nearer blue and this color extended considerably beyond the more refrangible end of the spectrum, though somewhat weaker than in the violet band itself. In the blue band the chloride took a clear blue tint, which gradually became fainter as it merged into the green. The action was tardier in the yellow, sometimes it gave a light yellow tinge. In the red it was decidedly rosy and beyond, a sort of lilac tint, and then further on a feeble red.

When the moist silver chloride is first exposed for a certain time to the action of white light and then subjected to the rays of the spectrum, the blue and violet behave as above mentioned, but in the yellow and red regions, it is found that the silver chloride becomes lighter and although not intense, it is nevertheless quite apparent and cannot be mistaken.

In 1839, Sir John Herschel repeated the experiment by projecting the spectrum upon silver chloride which had been given a preliminary darkening by exposure and obtained colors approximately closer to the colors of the spectrum.

It was noticed by Daguerre that a red house gave a reddish image on his iodized silver plate, and Fox Talbot, early in his researches, observed that the red of a highly colored print, when superimposed in contact with a silver chloride paper and exposed for a considerable time to the sun, gave a decided red image.

But in a good many experiments the colors obtained by printing under colored glass did not correspond to the natural colors. Decided colored effect, to be sure, were had, but it is probable that in most cases they were the result of chemical changes brought about by heat more than by the light, for it is now well established that heat alone can be made to yield colored effects.

In 1848, Edmund Becquerel succeeded in reproducing upon a daguerreotype plate, not only all the colors of the solar spectrum, but also up to a certain point, the colors of lithographs.

Niepce pursued the subject and got much more intense colors than his predecessor. A silver plate was properly polished and coated with a thin film of silver chloride. Under the influence of light it gave color more or less intense according to the way the chlorides action was effected.

A silver plate is immersed in a solution of ferric chloride, or cupric chloride or in a mixture of the two solutions, washed and dried or it may be put in water impregnated with chlorine gas until it takes a faint coloration. (Becquerel preferred to use voltaic chlorination.)

This silver plate takes the place of the positive pole in a solution of hydrochloric acid ($12\frac{1}{2}$ per cent); the negative pole being of platinum.

A minute or two of immersion produces, successively, a gray, yellowish violet and, finally, a bluish tint, which are again repeated in the same order.

The moment the violet begins again to appear, the operation is stopped, the plate washed and dried over a spirit lamp. The plate so prepared on exposure gives all the colors of the spectrum—the blue and violet with the greatest intensity, but the green is rather faint. When the plate is subjected to heat and so exposed, the colors are more vivid, particularly in the yellow region.



"THIS IS GOOD." BEN V. MATTHEWS



"HAPPY." BEN V. MATTHEWS

It would seem that, the sensitiveness of the silver chloride to color impression depends upon its thickness and on the concentration of the chlorinizing solution and probably upon the purity of the deposit.

Copper would seem to be essential since its presence gives to the colors greater brilliancy than when silver chloride alone is used. It was found, too, that dilute solutions of chlorine favored the reproduction of the yellow; on the other hand, concentrated chlorine favored the orange and the red regions.

Later on in his experimentation Niepce chlorinized by use of calcium and magnesium chlorides with copper sulphate.

It was also found that a preliminary treatment of the chlorinized plate to a strong bath of lead chloride in dextrine greatly exalted the sensitiveness. Upon films of this character positive pictures of considerable beauty were obtained.

In the collodion days sometimes indications of colors were manifest. These colors were likely to show up after fixation of the image with potassium cyanide and when the plate was subjected to combined vapors of chlorine and iodine.

Wharton Simpson, in a paper published in *Photographic News*, found that his chloride of silver emulsion with a slight excess of silver nitrate and citric acid (free silver) is colored under a red glass, red, under an aniline green, green.



"THE MADONNA OF THE GHETTO." KARL TAUSIG

It is well known that pure silver chloride spread upon paper becomes rapidly violet in the ultra violet rays, but in the visible violet and blue the change is slower.

If the paper is given a preliminary exposure to light, so that a sub-salt is formed, it gives the spectrum colors, but rather feebly in the yellow and green.

Silver chloride, in the presence of an excess of silver nitrate, blackens only in the ultra violet, but if first exposed to diffused light it is sensible to the visible spectrum from the red to the blue, the colors are, however, not vivid, but nevertheless distinguishable.

If highly oxygenized bodies, like potassium permanganate, are added to it, greater strengths of image are produced.

(To be continued)

VANADIUM TONING—E. J. WALL, F.R.P.S.

IT seems to be an accepted axiom by all photographic writers that vanadium will give green tones on developed prints or lantern slides, whereas, as a matter of fact, it will not do anything of the kind. The tones obtained by vanadium are a deep yellow, tending to orange and without the slightest trace of green. It is perfectly true that the baths recommended will give greens, but I have been unable to find anywhere, except by Namias, explicit directions as to modifications of the tones, only by varying the duration of toning and in no case the real reason of the greens. Whether the colors obtained are artistic or desirable is another question, but certainly for lantern slides they are very effective sometimes.

R. Namias¹ was the first to point out that vanadium would tone silver and he stated that the color obtained was yellow. W. F. Fox² also pointed out that vanadium gives yellow images. The method adopted by Namias for toning was to immerse the prints in ferricyanide solution and then in solution of a salt of the metal, for instance, vanadium chloride, copper chloride, etc. This has obviously the disadvantage of two baths, and in 1903³ he recommended one bath containing

Ferric chloride	4.8 g.
Vanadium chloride	4 g.
Ammonium chloride	10 g.
Hydrochloric acid	10 ccs.
Water	1,000 ccs.

And he says "since the ferri ferrocyanide is blue and the vanadium ferrocyanide yellow, there is obtained by mixing the two chloride compounds, the desired green." C. W. Somerville⁴ follows on the same lines and H. E. Smith⁵ goes

¹ Eder's Jahrbuch, 1901, p. 171.

² U. S. P. 1166123, 1915.

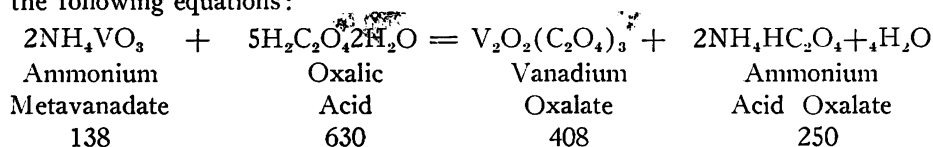
³ Eder's Jahrbuch, 1903, p. 158.

⁴ "Toning bromides and lantern slides." London, 1904, p. 49; *A. P.*, 1909, p. 101; *Phot. News*, 1904, p. 650; Eder's Jahrbuch, 1905, p. 424. Unfortunately I have not been able to have access to Somerville's book, so that I may be doing him an injustice in suggesting that he does not give the method of varying the tones. I have had to rely on Eder and Mebes' "Der Bromsilber-und Gaslicht-Papier-Druck," 1913, p. 454.

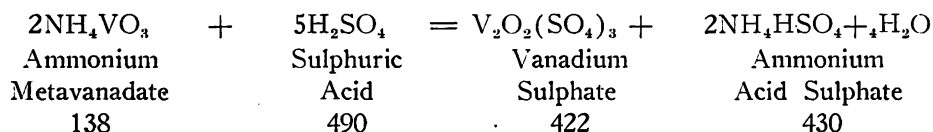
⁵ *Brit. J. Phot.*, 1913, p. 416.

somewhat elaborately into the question and gives precise directions for making the vanadium chloride solution and lays great stress on the poisonous nature of oxalic acid; it certainly is poisonous, but so is nearly every other chemical used by photographers. My objection to all these baths is that they contain a chloride and hydrochloric acid, which must form some silver chloride which dulls the transparency of the resultant images. A few experiments were made to see whether it was not possible to avoid entirely the use of the chloride, and it may as well be admitted now, that actually I was forced to do this because it was impossible to obtain vanadium chloride during the late war. Another point is that vanadium chloride, unless obtained in the syrupy form, is not a convenient salt to work with, as it is not easy to get into solution.

A far easier method of using vanadium is to make either the oxalate or sulphate from ammonium metavanadate, which is a comparatively cheap salt, and no one need be frightened at the method here suggested, because it involves no very deep chemical problems or delicate manipulations. To clear the ground, however, and to show why certain things are to be done, the following explanation is given for those interested in the chemical side of the subject. It was assumed that the formula for the oxalate was $V_2O_2(C_2O_4)_3$ and that for the sulphate $V_2O_2(SO_4)_3$; that for the metavanadate is NH_4VO_3 , hence we obtain the following equations:



and



The figures under the names are the molecular or combining weights and tell us exactly how much of each salt to take and what should be the weight of the salt obtained. From these figures have been calculated the quantities of chemicals to use, starting with 100 grammes of ammonium metavanadate^a. This should be placed in a beaker or evaporating dish and 460 grammes of pure oxalic acid added. To this should be added with constant stirring 500 ccs. of distilled water and the mixture heated. It should form a thick paste, but as the temperature rises it becomes more fluid and will change from white to an orange and finally a dirty grey-green. More water may now be added and the heat continued till perfect solution is obtained and the color will change to a brilliant blue and the total bulk should be made up to 1477 ccs., when we shall have a 20 per cent solution of the oxalate, containing a slight excess of oxalic acid (the theoretical quantity of acid is 456 g.), and some ammonium acid oxalate, which we can

^a For those who do not use the metric system, the same quantities may be taken in grains and minims. The quantity of sulphuric acid may not seem to agree with the equation, but the specific gravity, which is very high 1.845, must be taken into consideration.

ignore, for as far as I have been able to find out this merely helps to keep the bath.

To make the sulphate the same procedure is adopted. The metavanadate is made into a cream with about 200 ccs. of distilled water and then 197 ccs. of strong sulphuric acid added with constant stirring and without heat. The heat generated on the addition of the acid may be enough to cause solution, but if not, then the mixture may be heated and more water added till the total bulk measures 1477 ccs. and we have a solution that contains exactly the same proportion of vanadium, and that is all that we care about, because the acid, whether oxalic, sulphuric, citric, tartaric or nitric plays no part in the toning process. I have tried them all and prefer the oxalic acid, as it introduces less strange salts into the bath proper.

It is interesting to note that all the salts of vanadium that I have prepared in solution are bright blue and the sulphate, in crystalline form, is the most vivid blue salt that I have seen, much more so than cupric sulphate. Whether the salts formed are the pure salts or compounds of vanadium and ammonium I do not know, but they keep well in solution and tone well. I believe they are sensitive to light, and it is advisable, therefore, to keep them in the dark. My



"MY LOU." KARL TAUSIG

method of keeping such solutions is to cover the bottles with black paper, such as is used for wrapping plates and papers, and this is pasted on to the bottles and covers the same right up to the lower edge of the lip and under the bottom, too. If the paper is cut into strips near the top and bottom it will be found that it can be overlapped and will form a very neat and perfectly light-tight job. I have kept thus solutions of ferric oxalate on the shelves of an open laboratory for twelve months without change, and this is a pretty severe test.

As regards the bath itself I do not find any preference in action between the two salts, but the oxalate is, I think, to be preferred, as one, then, has in the bath nothing but oxalate and ferricyanide. It is probably well known to many that ferricyanide is usually contaminated with ferrocyanide, due to the reduction by the air, and the usual plan recommended is to weigh out a little more of the salt than is actually required and rinse it with water and then dissolve, but it does not seem to be so generally known that a solution that will keep well can be obtained by adding 1 per cent of potassium dichromate and boiling.

I have already given instructions how to make the ferric oxalate⁷ and the only point that requires emphasis is that this salt is very sensitive to light and nearly all commercial samples are unsuitable for toning because they have been carelessly kept by the dealers, so that it is far better to make it.

As regards the toning bath itself, it is impossible to give a definite formula, for the simple reason that its composition is dependent on the tone or shade of green required, but it is possible to point out how this can be varied. The basis of the bath is as follows:

Vanadium oxalate sol.	50 ccs.
Oxalic acid sat. sol.	50 ccs.
Ammonium alum sat. sol.	50 ccs.
Ferric oxalate sol.	X
Glycerine	50 ccs.
Potassium ferricyanide 10 per cent sol.	10 ccs.
Water	1,000 ccs.

To mix this add the oxalic acid solution to the vanadium and add half the water, then add the alum solution and then the ferric oxalate. It will be noted that the quantity for this is X, unknown, and the only way to determine what quantity to use is to try it out, remembering that the more iron used the bluer the tone. With only 10 ccs. in the above bath a bright, almost emerald, green is obtained. The ferricyanide should be mixed with the glycerine and the other half of the water and then added to the other solution and the result should be a perfectly bright, clear green solution that will not deposit while toning. It is, however, sensitive to light and readily throws down a blue precipitate, after using, in daylight.

I do not like the use of saturated solutions, but in this case they are simple to use and the reason why the alum is added is because it tends to keep the whites clear as pointed out by Sedlacek⁸ and the acid helps to keep the solution

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while in use. Toning takes from ten to fifteen minutes and the prints should be immersed for five minutes in 10 per cent solution of sodium sulphate solution and lightly washed and dried. There is not the slightest necessity to fix them, as the tones are wonderfully transparent, as there is no opaque silver chloride to remove, and though one must suppose that some silver ferrocyanide is formed, this does not seem to detract from the transparency. The temperature of the bath should be 18 C. (65° F.). The glycerine is employed to keep the solution better while in use; it is not actually necessary and may be omitted without any prejudice, except that the bath seems a little more prone to deposit. No attempts have been made to find out how long the bath could be used, or in other words how soon a change of tone makes its appearance. This must, of course, happen, as the bath must be exhausted to some extent with each print or slide immersed, but it was found to give quite a reasonable number of slides of all the same tone without renewal. Overdevelopment of the images seems quite unnecessary, as there is little or no intensification.

BEING CAREFUL HOW WE TALK OF COMPETITORS' GOODS

NOT long ago a retail merchant in a town in New York State was given the agency for a certain oil to be used for automobiles and tractors. The firm which was to supply the oil was long established and reputable, and the agency looked like a good thing.

The retailer sold lots of this oil and the manufacturer was able to make prompt shipment. In a little while there was a lot of it out among automobile owners and tractor owners in that section.

Almost at once complaints began to pour in as to troubles with engines that never balked before this oil was used. The retailer made a careful investigation and concluded that it was this oil and nothing else, and he so advised the manufacturer. The latter sent a representative to the place and he too made investigation. At first he was inclined to sidestep responsibility, but the evidence was so overwhelming that he finally advanced the theory that a former employee, who had been angry at the company when he left, had introduced some acid into certain shipments of oil. He finally agreed that the retailer should recall all the oil that he had sold, but which was still unconsumed, and ship it back to the factory to be replaced with new.

The retailer was greatly dissatisfied with the transaction, and gave up the account, putting in a competitive oil. Naturally he was not backward in telling people the reason, with the result that he has pretty thoroughly killed the demand for that manufacturer's oil in that territory.

Now the manufacturer is about to sue him for damages for slander and libel, claiming that the talking the retailer did—some writing, too—has destroyed his business and cost him thousands of dollars.

Can he recover? I think not; not if the facts have been correctly given



"CURLY-HEAD." KARL TAUSIG

the opposite direction from the source of light, while the location of a reflection in relation to that of an object is dependent upon the angle of the reflecting-surface, independently of the angle of illumination. In a scene containing still water the reflections always fall toward the spectator, but if the objects producing them are brightly lighted from one side they will cast shadows across the field of vision at right angles to the direction of the reflections.

Water, ice, glass, and polished surfaces of any kind, all transmit reflections more or less distinctly, depending upon their smoothness or polish and the brilliancy with which the material causing them is illuminated.

Lighter tones, as a rule, are reflected more strongly than darker ones, this being especially noticeable when reflections fall upon a broken surface. On water, whose surface is broken into wavelets, a high-light, like the sun or a white sail in sunshine, will be reflected when the darker tones of any object will make little or no impression. This is also true of reflections upon a dark surface, such as a polished table-top of dark wood; the darker portions of the subject being almost lost, while the lightest parts are clearly seen in the reflection—a fact due to the tonality of the reflecting surface being nearer in value to the dark tones of the subject than they are to the light ones. Whatever the surface, one invariable rule is that a reflected high-light cannot be stronger, or higher in key, than its source. As a matter of fact it is at best a trifle less bright and usually much less brilliant than the surface producing it. This fact should be remembered when the question of relative values comes up in picture making. It is possible, however, for the highest light in a picture to occur in a reflection when



"A STUDY IN REFLECTIONS." WILLIAM S. DAVIS



"WAITING." BEN V. MATTHEWS



"WHAT'S THE JOKE?" BEN V. MATTHEWS

the light which produced it is excluded from the composition, as when a sunshine effect upon water is shown without including the sun.

The relative depth of the darker tones in a reflection, as compared with their source, varies a good deal according to the tonality and clearness of the reflecting surface, so it is hardly safe to do more than indicate in a general way what may be expected. If reflections fall on a dark, highly polished surface, or one is looking into deep clear water (rather than along the surface at a low angle), the reflection of a dark object may appear deeper in tone than the original, but when the reflecting surface is light in tone, somewhat dull, or consists of shallow, muddy water, the result is likely to be reversed—the reflection being rather lighter than the dark tones of the original. If a reflection comes from shallow water in the immediate foreground, the nature of the bottom will affect the tone of the reflection, since when looking down through the surface of the water one can see to a certain extent the tone of the bottom, and this mingles with those of the reflections.

The practical conclusions to be drawn from the foregoing is that reflections cannot show greater range of contrast than the original, and owing to a reduction in perfection of the reflecting surface, due to such causes as those just



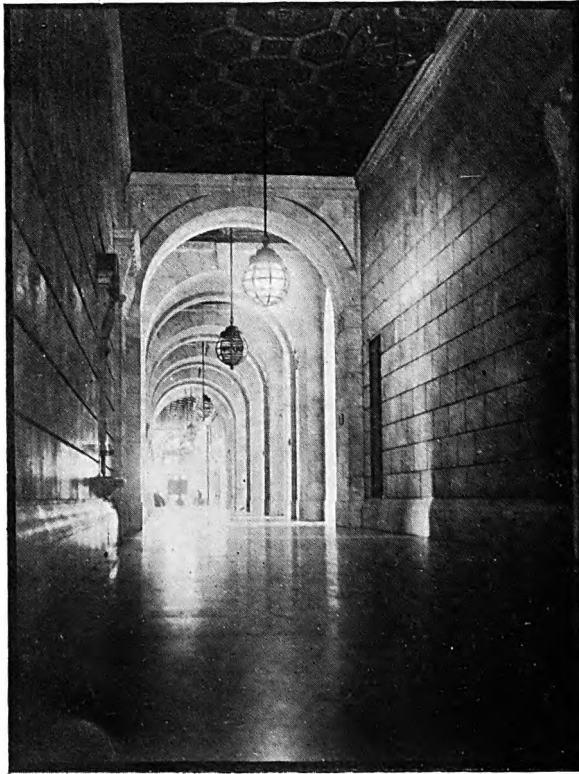
"AFTER THE RAIN." WILLIAM S. DAVIS

mentioned, are generally less sharp and brilliant in tone than the scale of contrasts found in the objects they come from. In rendering them pictorially it is well they should be represented as less clear in tone and detail than the solid objects in the composition, since this makes for greater harmony of effect.

Probably the greatest pictorial value of reflections lie in the possibilities they afford for transforming an otherwise flat, monotonous, foreground into a feature of interest and beauty, filled with attractive tonal effects and soft detail. Next to this comes the utilization of reflections to balance other parts of a composition, either by a reversed repetition of lines and masses, or the introduction of light tones where needed.

When reflections can be made an important feature, one must decide at once whether they shall be used as the dominant feature of the picture, or accessory to the other material, for equal spacing between objects and reflections cannot fail to create a division of interest instead of helping to pull the composition together.

Our illustrations are intended to bring out some of the points mentioned. In the one called "After the Rain," the puddle left in a country lane is simply used as a valuable accessory to introduce some varied tones where there would



"REFLECTIONS"—NEW YORK PUBLIC LIBRARY
© WILLIAM S. DAVIS

otherwise have been an unbroken expanse of dark, muddy road for a foreground. It also leads the eye into the picture in a pleasing manner, and balances, by partial tone-repetition, the light area of the sky.

The next, "A Study in Reflections" (which was made immediately after the first illustration), features the reflections of the wayside trees. To do this without a clash of interest, the skyline was kept high enough to cut off a large portion of the objects in the middle distance and distance which are seen in "After the Rain." In this way it was possible to let the reflections show a considerable amount of material, the source of which lay outside the upper margin of the picture. The portions of bare ground visible at the right, and through the middle of the road, help give a feeling of perspective and flatness to the surface of the water, which is, of course, necessary to prevent it appearing to slant upward.

Our third subject—"Reflections—N. Y. Public Library"—is of an entirely different character, and suggests some of the effects which may be seen upon polished surfaces in an interior. In this case the lighting was a combination of daylight and electricity, the latter coming from lanterns suspended from the high ceiling, and as the floor and walls of the hall are highly polished colored marble, they made excellent reflecting surfaces.

Many times reflections less prominent than those in the subjects illustrated make just as important a contribution to the effect of a composition as a whole. In a marine, for instance, showing wharves and shipping, slight ripples in the water break the sharpness of the reflections into interesting wavering lines, admirably calculated to lead the eye up to the objects casting them, when a perfectly clear inverted image would be likely to divert attention.

To preserve the feeling of flatness in the surface reflecting an object it is very necessary to avoid the hardness which comes from under-exposure, since this destroys surface textures.

NATURAL COLOR PHOTOGRAPHY

PHOTOGRAPHY, strictly speaking, is a reproduction of nature in monochrome.

We all know that the salts of silver used, whether used for direct printing-out, or for getting what is called the "latent image," and its subsequent presentation by development yield impressions in monochrome more or less black images, and never by ordinary processes give things in the color of nature. Yet it is possible by certain procedures to get color closely approximating those of actual things—the colors of the solar spectrum, for instance.

Before the real discovery of practical photography by Daguerre in 1839, Seebeck, in 1810, did get a fairly accurate reproduction of the spectrum on silver chloride.

He rigged up a contrivance by which he kept the image of the solar spectrum in a fixed position, projected upon a moist chloride of silver paper for 30 minutes and found that in the violet band the image was reddish purple,

sometimes more violet, sometimes nearer blue and this color extended considerably beyond the more refrangible end of the spectrum, though somewhat weaker than in the violet band itself. In the blue band the chloride took a clear blue tint, which gradually became fainter as it merged into the green. The action was tardier in the yellow, sometimes it gave a light yellow tinge. In the red it was decidedly rosy and beyond, a sort of lilac tint, and then further on a feeble red.

When the moist silver chloride is first exposed for a certain time to the action of white light and then subjected to the rays of the spectrum, the blue and violet behave as above mentioned, but in the yellow and red regions, it is found that the silver chloride becomes lighter and although not intense, it is nevertheless quite apparent and cannot be mistaken.

In 1839, Sir John Herschel repeated the experiment by projecting the spectrum upon silver chloride which had been given a preliminary darkening by exposure and obtained colors approximately closer to the colors of the spectrum:

It was noticed by Daguerre that a red house gave a reddish image on his iodized silver plate, and Fox Talbot, early in his researches, observed that the red of a highly colored print, when superimposed in contact with a silver chloride paper and exposed for a considerable time to the sun, gave a decided red image.

But in a good many experiments the colors obtained by printing under colored glass did not correspond to the natural colors. Decided colored effect, to be sure, were had, but it is probable that in most cases they were the result of chemical changes brought about by heat more than by the light, for it is now well established that heat alone can be made to yield colored effects.

In 1848, Edmund Becquerel succeeded in reproducing upon a daguerreotype plate, not only all the colors of the solar spectrum, but also up to a certain point, the colors of lithographs.

Niepce pursued the subject and got much more intense colors than his predecessor. A silver plate was properly polished and coated with a thin film of silver chloride. Under the influence of light it gave color more or less intense according to the way the chlorides action was effected.

A silver plate is immersed in a solution of ferric chloride, or cupric chloride or in a mixture of the two solutions, washed and dried or it may be put in water impregnated with chlorine gas until it takes a faint coloration. (Becquerel preferred to use voltaic chlorination.)

This silver plate takes the place of the positive pole in a solution of hydrochloric acid ($12\frac{1}{2}$ per cent); the negative pole being of platinum.

A minute or two of immersion produces, successively, a gray, yellowish violet and, finally, a bluish tint, which are again repeated in the same order.

The moment the violet begins again to appear, the operation is stopped, the plate washed and dried over a spirit lamp. The plate so prepared on exposure gives all the colors of the spectrum—the blue and violet with the greatest intensity, but the green is rather faint. When the plate is subjected to heat and so exposed, the colors are more vivid, particularly in the yellow region.



"THIS IS GOOD." BEN V. MATTHEWS



"HAPPY," BEN V. MATTHEWS

It would seem that, the sensitiveness of the silver chloride to color impression depends upon its thickness and on the concentration of the chlorinizing solution and probably upon the purity of the deposit.

Copper would seem to be essential since its presence gives to the colors greater brilliancy than when silver chloride alone is used. It was found, too, that dilute solutions of chlorine favored the reproduction of the yellow; on the other hand, concentrated chlorine favored the orange and the red regions.

Later on in his experimentation Niepce chlorinized by use of calcium and magnesium chlorides with copper sulphate.

It was also found that a preliminary treatment of the chlorinized plate to a strong bath of lead chloride in dextrine greatly exalted the sensitiveness. Upon films of this character positive pictures of considerable beauty were obtained.

In the collodion days sometimes indications of colors were manifest. These colors were likely to show up after fixation of the image with potassium cyanide and when the plate was subjected to combined vapors of chlorine and iodine.

Wharton Simpson, in a paper published in *Photographic News*, found that his chloride of silver emulsion with a slight excess of silver nitrate and citric acid (free silver) is colored under a red glass, red, under an aniline green, green.



"THE MADONNA OF THE GHETTO." KARL TAUSSIG

It is well known that pure silver chloride spread upon paper becomes rapidly violet in the ultra violet rays, but in the visible violet and blue the change is slower.

If the paper is given a preliminary exposure to light, so that a sub-salt is formed, it gives the spectrum colors, but rather feebly in the yellow and green.

Silver chloride, in the presence of an excess of silver nitrate, blackens only in the ultra violet, but if first exposed to diffused light it is sensible to the visible spectrum from the red to the blue, the colors are, however, not vivid, but nevertheless distinguishable.

If highly oxygenized bodies, like potassium permanganate, are added to it, greater strengths of image are produced.

(To be continued)

VANADIUM TONING—E. J. WALL, F.R.P.S.

IT seems to be an accepted axiom by all photographic writers that vanadium will give green tones on developed prints or lantern slides, whereas, as a matter of fact, it will not do anything of the kind. The tones obtained by vanadium are a deep yellow, tending to orange and without the slightest trace of green. It is perfectly true that the baths recommended will give greens, but I have been unable to find anywhere, except by Namias, explicit directions as to modifications of the tones, only by varying the duration of toning and in no case the real reason of the greens. Whether the colors obtained are artistic or desirable is another question, but certainly for lantern slides they are very effective sometimes.

R. Namias¹ was the first to point out that vanadium would tone silver and he stated that the color obtained was yellow. W. F. Fox² also pointed out that vanadium gives yellow images. The method adopted by Namias for toning was to immerse the prints in ferricyanide solution and then in solution of a salt of the metal, for instance, vanadium chloride, copper chloride, etc. This has obviously the disadvantage of two baths, and in 1903³ he recommended one bath containing

Ferric chloride	4.8 g.
Vanadium chloride	4 g.
Ammonium chloride	10 g.
Hydrochloric acid	10 ccs.
Water	1,000 ccs.

And he says "since the ferri ferrocyanoide is blue and the vanadium ferrocyanoide yellow, there is obtained by mixing the two chloride compounds, the desired green." C. W. Somerville⁴ follows on the same lines and H. E. Smith⁵ goes

¹ Eder's Jahrbuch, 1901, p. 171.

² U. S. P. 1166123, 1915.

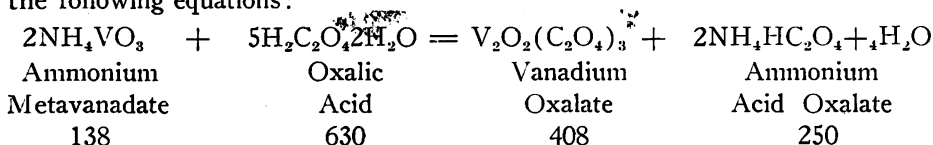
³ Eder's Jahrbuch, 1903, p. 158.

⁴ "Toning bromides and lantern slides." London, 1904, p. 49; *A. P.*, 1909, p. 101; *Phot. News*, 1904, p. 650; Eder's Jahrbuch, 1905, p. 424. Unfortunately I have not been able to have access to Somerville's book, so that I may be doing him an injustice in suggesting that he does not give the method of varying the tones. I have had to rely on Eder and Mebes' "Der Bromsilber-und Gaslicht-Papier-Druck," 1913, p. 454.

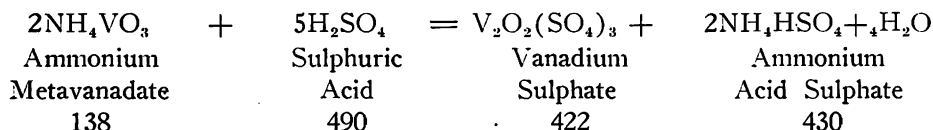
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Glycerine	50 ccs.
Potassium ferricyanide 10 per cent sol.	10 ccs.
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NOT long ago a retail merchant in a town in New York State was given the agency for a certain oil to be used for automobiles and tractors. The firm which was to supply the oil was long established and reputable, and the agency looked like a good thing.

The retailer sold lots of this oil and the manufacturer was able to make prompt shipment. In a little while there was a lot of it out among automobile owners and tractor owners in that section.

Almost at once complaints began to pour in as to troubles with engines that never balked before this oil was used. The retailer made a careful investigation and concluded that it was this oil and nothing else, and he so advised the manufacturer. The latter sent a representative to the place and he too made investigation. At first he was inclined to sidestep responsibility, but the evidence was so overwhelming that he finally advanced the theory that a former employee, who had been angry at the company when he left, had introduced some acid into certain shipments of oil. He finally agreed that the retailer should recall all the oil that he had sold, but which was still unconsumed, and ship it back to the factory to be replaced with new.

The retailer was greatly dissatisfied with the transaction, and gave up the account, putting in a competitive oil. Naturally he was not backward in telling people the reason, with the result that he has pretty thoroughly killed the demand for that manufacturer's oil in that territory.

Now the manufacturer is about to sue him for damages for slander and libel, claiming that the talking the retailer did—some writing, too—has destroyed his business and cost him thousands of dollars.

Can he recover? I think not; not if the facts have been correctly given



"CURLY-HEAD." KARL TAUSIG



"THE CLIMAX OF THE STORY." KARL TAUSIG

PITTSBURGH SALON, 1921

to me, and if the above is an accurate summary of them. The dealer merely told the truth, which is always a good defense. In a great many cases, however, competition leads men to go far beyond the legal limit, and they say things about competitive products which are untrue and slanderous and which give ground for legal action. Usually there is no legal action, the victim of such trade representations feeling that nobody pays any attention to such things. He is wrong, people do pay attention to them. They remember them a long time.

For instance, a man who had practically decided to buy a certain make of talking machine was in a large talking machine store one day buying some supplies. Casually he asked the proprietor if he knew the machine he had in his mind to buy. Yes, the dealer said, he knew all about it. Up to a week ago he had handled it. It was "no good at all," and he had to send it back and throw out the whole line. Why wasn't it any good? Because the tone arm constantly came loose and spoiled the reproduction.

Now the man to whom this was told did a rather unusual thing. He went back to the manufacturer of the machine involved and repeated what the dealer had said. The manufacturer investigated, finding that the line was



"THE COQUETTE." KARL TAUSIG

taken from the dealer in question because he didn't pay his bills, that the particular type of machine had never gone wrong while it was in the dealer's store, and that there was nothing whatever in his criticism. It was partly due to a desire for revenge on his part and partly to a desire to kill the sale of a competitive article.

This manufacturer took the matter to his attorney and was advised that he had a proper action against the dealer. This will shortly be brought, and if the jury believes the evidence, it will in all probability succeed. The course taken was right. Here was an unfounded and very mean attack upon a legitimate product, the reputation of which is as sacred as the reputation of any individual. No telling how far the harm done might go. Usually the customer who hears such stuff doesn't tell the victim about it; he repeats it to everybody interested, and they repeat it again, and so on indefinitely.

There have been a great many cases of trade libel, but nowhere near as many as there should be. As I said, competition goes too far. Only last week I heard an insurance agent say of a rival company, "Oh, don't put any money in there whatever you do. That concern is as crooked as a ram's horn."



"COUSIN BILL." CARL TAUSIG

The company named is absolutely reputable and among the leaders. The statement made was an outrageous slander and should never have been allowed to go unpunished. The company should have been informed of it at once and steps taken to pursue the author of the slander. And that, I think, will be done.

A seller of goods, or services, or what not, has a right to go pretty far in exploiting his wares. Naturally his chief asset is favorable comparison with competitive goods. In making that comparison he can express the strongest kind of an opinion about it; if he sincerely thinks so, and can show fair ground for his opinion, he can even say he thinks the other goods are no good. If he does so and even says why he thinks so, he will not be guilty of trade libel or slander. But to say a dealer is crooked, or a product is worthless, or "I'll bet that table goes to pieces inside of three months," as was done in one case, is wholly illegal, if not true, and an action will lie for it. And in many cases it ought to be brought. There is an astonishing amount of unfairness, unsportsmanship and slander in the way we talk about our competitor's products.

(Copyright by Elton J. Buckley.)

LOCAL WORK—PAUL W. EDDINGFIELD

WHY should a photographer have to resort to local work on his photographs, in order to make them perfect? If his subject, the light and lighting on his subject, his lens, camera, plates, developer and development, paper, etc., together with perfect mechanical work on his part, were all perfect, we would be safe in saying that his work would be perfect, technically, at least, but this is rarely, if ever, the case. Local work makes up for the deficiency of the above mentioned items; but its usefulness does not stop here by any means, because it furnishes the photographer one of the best means of stamping his personality on his work. So an article on "Local Work" is as instructive to the pictorial photographer as it is to the commercial photographer. The photographer who makes portraits to sell, without reference to pictorial composition, is just as much a commercial photographer as the man who photographs stoves.

In the past we have applied powder, paint and chemical solutions, with more or less success; knowing that this method was poor, but the best we had at our command. Now, we have a better method, using an air brush. "But," you say, "air brushes cost twenty-five dollars, and the air-pressure tanks you have to use with them are so bulky that it is out of the question for me to purchase an air brush." Knowing this was all true, I set out to find a substitute. I tried the ordinary atomizer, but found that it threw drops of ink instead of a fine spray. Next I tried a nebulizer and found that it answered my purpose nicely. In this instrument the spray is thrown against the inner side of the bottle, breaking it into fine nebula. The nebulized ink contains no large drops, if the ink has been prepared right. The one I use

is the "Imperial Nebulizer" made by the A-Kay Rubber Co., Indianapolis, Ind. I purchased it at an ordinary drug store, and it cost me one dollar. The only perishable part of it is the rubber bulb, but this can easily be replaced by a new one when the old one is worn out. But please remember that *an ordinary atomizer will not do for our use.*

Almost any ordinary writing ink or liquid water color may be used by adding one part of mucilage to every eight or nine parts of ink; but I greatly prefer to make my own, because I know there is nothing in it that might injure the delicate photographic image, and I also know, from experience, that it works the best. The following is my formula: Make the mucilage by dissolving two parts, by weight, of gum arabic in three parts of water. Either powdered or crystal gum may be used, but I generally use the powdered because it dissolves in a much shorter space of time. This solution is best prepared by the use of a mortar and pestle. If this solution or the finished ink is to be kept very long, two or three drops of formaldehyde should be added to every ounce of solution, in order to prevent fermentation. By the way, this makes a fine mucilage for office or photographic use.

Now add about the same amount of lamp black, by measure, as you have mucilage, and grind the two together. Dilute this mixture with five or six times its bulk of water, and it is ready for use. You really have india ink. You will find it a fine ink for drawing, writing, etc., and it is fadeless when a permanent pigment like lamp black is used. When working on negatives with the nebulizer you will find black preferable to any other color used in the ink, owing to the ease of judging the printing density of your local work. When working on prints you may use any colored pigment in the ink you wish.

You are now ready to commence. All of the work on the negative should be done on the glass side, in order to give diffusion to the work. If you use films, attach the film to a piece of glass and proceed the same as if working with a glass negative. Remember that all the work done on the negative darkens it and has the effect of lightening the finished print. First clean the side to be worked on. Gently heat the negative and place it on some support as nearly vertical as you can with safety. Place some white object on the opposite side, so you can judge the density and character of your work. This leaves both hands free to use the nebulizer, which is necessary. (There may be times when you wish you had three hands.)

To give an even flat tint to a large surface, hold the end of the nebulizer two or three inches from the negative and spray lightly, *keeping the nebulizer moving* to and fro during the operation. If you do not keep the nebulizer moving while using the bulb, you will secure an uneven tint. Do not spray too heavily at first, but go over the surface time after time until you secure the necessary opacity. It is not a difficult thing to do after a little practice.

I have found that my nebulizer gives a crescent shaped spray, convex side up. Thus, if I move my nebulizer across my negative in a horizontal line, while spraying, the bottom part of this line will have more diffusion

than the upper part. I often take advantage of this peculiarity in various ways, one of which is as follows: In a portrait one side of the face is too dark. Place this side up, and it is an easy matter to lighten it—referring to the finished print when I say “lighten it.”

There are three ways of confining the spray to small spaces. First, by putting a hood containing a small hole over the end of the nebulizer. Second, by spraying broadly and removing the ink where it is not wanted with a damp cloth. Third, by using a mask. For most purposes I greatly prefer the latter. The further the mask is from the negative, the more diffused the outline will be. It is an ideal method for making vignettes. Take the returned proof, cut out the figure and use this as a mask. Spray a heavy, opaque, diffused line around this mask, remove the mask and paint the space between this line and the edge of the negative with a brush and opaque.

An ideal method of securing results is to remove the negative from the developer before it has developed far enough to secure sufficient contrast and then work up the highlights with the nebulizer. The results will surprise you.

In all of my preceding instruction I have been telling you how to darken the negative, thus securing lighter effects in the finished print; but the opposite effect may be secured in three different ways, namely: First, by making a glass positive from your first negative, using the nebulizer on this and making a new negative from this positive, using this second negative to make your prints from. Slow plates should be used for the positive and second negative. Second, by making an enlargement on smooth paper, using the nebulizer on this, and making a reduced negative from this. Third, by spraying a chemical reducer on the film side of the negative. In order to make the solution thick enough to nebulize, add one part of pure glycerine to every nine parts of the solution. These methods give prints that show absolutely no grain; however, if the slight grain is not objectionable, the ink may be sprayed direct on the finished prints.

Highlights, shadows and backgrounds may be worked in, and objectionable objects may be softened or removed; in fact, there is hardly any limit to the work that may be accomplished in the hand of the one who had become proficient. There is nothing so very hard about the process, but for fear there should be those who will have trouble, I will give a list of the failures you may experience, their cause and prevention.

No spray is emitted.—Not using enough force on the bulb; solution too thick (add more water); some coarse particles in tubes of nebulizer (the ink should always be filtered before using); or perhaps you are expecting it to spray too fast.

Nebulizer throws drops instead of a fine spray.—Solution is too thin (add more of the pigment-gum solution).

Spray collects in drops after striking the negative.—Negative is too cold (it should be warm, or even hot); or spraying too fast (spray slower).

DEVELOPMENT AFTER FIXATION

INTEREST was aroused, about 1898, from the experiments of Mr. Sherry, of London, that a plate could be developed after fixation. The announcement seemed so contrary to what one naturally expected from the supposition that the agency of the hypo is in the direction of dissolving any trace of silver from the developer placed in it.

The conclusion reached at the time as an explanation of the phenomenon that it was not to be accounted for by the theory of chemical evolution of the image, but to be ascribed to physical action, akin to what takes place when a developed and fixed plate is subjected to intensification. We see in the case of intensification (with mercury, for instance), the image, which is weak, build up, and are at loss to understand on what the deposit is formed.

With chemical development the silver particles which have been acted upon by light in the exposure of the plate are reduced; with the physical development, on the contrary, a deposition of silver is superimposed upon the exposed image from the developer.

Dr. Neuhaus continued experiments in reference to this interesting subject with some rather remarkable results.

The experiments were made on both bromo-silver plates and also on chloro-bromo-silver. The results obtained in both cases were almost identical in character. A plate was exposed for 3 seconds, developed in the usual way, serving as a means for comparison. It exhibited proper exposure (in fact, ample), 1 second probably would have sufficed. It is designated No. 1. The other plates, Nos. 2-4, were also exposed, but immediately after placed in the hypo solution and, after fixation, thoroughly washed, then developed in

Water (dist.)	100 cc.
Ammonium thiocyanate	24 grams
Silver nitrate	4 grams
Sodium sulphite	24 grams
Hypo	5 grams
Potass. bromide (1-10)	6 drops

Take for use 6 pints to 24 of water and 2 cc. of Rodinal. The development is very tardy (12 hours). After completion, wash thoroughly.

The negative thus formed looks like a bleached image obtained by intensification of a negative with mercury.

To darken the image the following was resorted to: Exposure to the direct light of the sun and treatment with any of the ordinary developers, but with no effect whatever. But the phenomenon was here presented which seemed so contrary to expectation, that is, the developed bleached image, when placed in the ordinary mercury intensifier (bichloride, 1-200) darkened, while an ordinary negative bleached out. But if this darkened plate is allowed to stay a long time in the mercury intensifier, it also bleaches again just like the ordinary negative submitted to intensification and can be blackened by means of a solution of sodium sulphite, producing a brilliant, good printing negative.

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We have frequently called attention to the striking similarity in the work of the great painters to some of the best photographic productions of landscape, portraiture and incident photography, exhibiting to the same degree the relation to compositions by the painters of real life. This affinity of the photographic landscape to a well painted and composed scene from nature by the brush was most prominently brought before us after an examination of some beautiful reproductions from the work of the great English painter, Constable.

One picture in especial, the "Hay Wain." This work ought to be studied by the photographer in search of the picturesque, not only for its admirable composition, but also for its truth to nature, management of light and shade and exquisite drawing of clouds, trees, churches, mills and other country objects.

Constable is a master in drawing, as he is also in color and chiaroscuro. In color especially his pictures are instructive to photographers. They have scarcely anything which might be called warm coloring, yet they express the warmth of summer so truly that one fancies he sees the tremulous heated air near the ground. He never falls into the too common mistake of mediocre painters, or even some of the good painters who influenced Turner so particularly, that what are called warm colors are essential to convey the idea of warmth in landscape. The truth is that red, orange and yellow are only seen in the sky at the coolest hours of the day, and Constable fearlessly painted mid-summer

noon-day heat with blues, greens and grays forming the predominant masses, and succeeded because his sensibility of eye directed him to the true colors at the season he most loved to paint, and which he generally indicates by an elder bush in flower.

We regret to announce the death of Fayette J. Clute, editor of *Camera Craft*, San Francisco, Cal., on January 28th. Aged 56 years.

Mr. Clute suffered from an incurable malady and for many months past, contrary to his physician's advice, kept at his desk until the end. He leaves a widow and two sons.

Leonard A. Dozer, of Bucyrus, Ohio, for many years the Treasurer of the Photographers' Association of America and its President in 1916, died on February 14th. Aged 49 years.

Mr. Dozer was prominent in the affairs of Bucyrus and connected with many of its institutions; in fact, was one of the most prominent men in that city. He had a host of friends in photography throughout the United States and was one of the most likeable men we ever met.

H. D'Arcy Powers, M. D., a competent photographic authority, has assumed the editorship of *Camera Craft*, assisted by Mr. Edgar Felloes.

The Middle Atlantic States Convention

THE present indications for a big convention, with up-to-date ideas, is promised for the Middle Atlantic States Convention to be held in Baltimore, Md., on April 19th to 22d. Practically every space is sold and the manufacturers will have exhibits and displays that will remind one of the conventions of years past. In the demonstrations many new features will be shown, hence the Baltimore convention promises to be the banner convention of the Middle Atlantic States.

This year, we believe, special railroad rates will be given, and, when purchasing your ticket one way, ask for a return certificate, which will entitle you to half fare on your return home. In other words, railroad fare is to be a fare and one-half.

Special rates will also be given at the hotels.

We'll have more to say about the Dance,

Automobile Rides, Boat Trip, etc., later on, but, in the meanwhile, send in your dues to E. W. Brown, Treasurer, Beaver, Pa. Three dollars covers your membership and convention privileges for an active member; or two dollars if an associate member. But do it now while it is on your mind.

If you want to know about space or desk space, ask L. L. Higgason, Secretary, Asheville, N. C.

If you have pictures to send, address them to Middle Atlantic States Convention, care of J. W. Scott, President, 205 West Fayette Street, Baltimore, Md.

Everything is being arranged for your comfort. Come! You are welcome!

Half-Lights and Shadows

THE quality of greatest importance in a finished picture is that secured by a just appreciation of half-light and half-shadow. These are the harmonizing elements uniting the contrasts of the strong lights and the deep shadows, giving tone and finish.

There is a tendency with some photographers to disregard range of tone, whose work is made to appeal to those only who think that vagueness and indefiniteness or a low key constitute the *summum-bonum* of art. True, there are many pleasing effects so allowed, but the limitations constrain the productiveness of the artist and are apt to lead him into affectation and mannerisms. Those who unaffectedly come to study a picture will, on analysis, discover that those photographs in which have been secured the greatest amount of finished half-tones are the ones which candidly appeal to their unbiased taste; in other words, their appreciation of the natural.

Photographers really do not appreciate as much as painters the exquisite degree of refinement in photography's rendering of delicate tones of light and dark, obtainable only by the painter at the expense of labor and skill. In reality, this power of the camera is its prerogative to bring a fine art.

The refined gradations of a photograph are dependent upon a number of conditions for attainment, but the principal requirements are that the subject portrayed shall be so lighted that there shall be an abundant amount of half-light and half-shadow, and that the exposure shall be sufficiently prolonged to secure softness in the high-lights and delicate gradation of modeling in the shadows.

Great advance, of late years, has been made in studio-professional work, aided in a measure, we must acknowledge, by the marvelous perfection in the mechanical means.

We see advancement in the manner of lighting so as to get softness and finish. Seldom do we see, as we saw in former days of the art, the exposure of a face, one portion in a harsh glare of light and the rest in unmitigated darkness. Truly, our art is progressing, and the progress is being accelerated by the return of the professional from the vagaries of the somber school to the rational methods of illumination. They were forced by the pressure of circumstances out of the legitimate paths of art by the over-venturesome amateur. The stimulus from this source was for a time salutary in getting the profession out of the commonplace ruts of photography, but, after the inoculation had done its purpose, the system was restored and invigorated to a healthy activity.

The Mordant Dye Process as a Substitute for Chemical Toning

F. E. IVES, F.R.P.S., F.R.M.S.

THE mordant dye process is not suitable for coloring prints on paper, but for prints on glass or celluloid it offers the advantage that the solutions used are very much cheaper than the chemical toning solutions and keep good until exhausted by use. There is also the advantage that a practically unlimited variety of colors and tones can be obtained.

My earlier experiments were directed mainly to the production of pure transparent colors for trichromatic and color cine. work, and, after mastering this problem, attention has been directed to perfecting the application and control of the process to toning and tinting, particularly for cine. positives, but also for lantern slides.

For this purpose it suffices to further reduce the strength of the bleaching solution and the time of immersion, so that no bleaching action is evident to the eye, though there has been sufficient action to fix the required amount of color from the dye bath.

It is even possible with a number of basic dyes to mix a little of the normal bleaching solution with the dye solution without precipitation, and so to be able to watch the progress of the toning and stop it at the desired point. I do not recom-

mend this procedure, because it limits the choice of dyes, and is, after all, no quicker or better than the method by successive operations.

The bleaching bath which I recommend for this purpose is as follows:

Water	30	ounces
Potassium ferricyanide ..	5	grains
Ammonium bichromate ..	1	grain
Glacial acetic acid	¼	ounce

To insure even action, I prefer to immerse the positives *dry*, and the time of immersion may vary from 30 seconds to two minutes, according to the amount of color desired in the finished result. Five minutes' washing is desirable before immersion in the dye bath. Good dyes to use are malachite green, saffranine, phenosafranine, rhodamine, auramine. Stock solutions may be made up with one grain of dye to each four ounces of water and a little acetic acid. These solutions can be mixed to produce a great variety of tones.

The amount of color mordanted depends not only upon the time of immersion in the bleach, but upon the time of immersion in the dye bath; the best results are obtained with short immersion in the bleach and long immersion in the dye bath—half an hour or more for some dyes. With a suitable amount of acetic acid in the dye bath (the requisite amount depending upon the dye used) a few minutes' washing in plain water after dyeing clears the whites perfectly. If a tint is desired in addition to the tone, this washing is omitted.

It is an interesting fact that extremely fugitive dyes produce quite permanent color prints by this process.

I venture to predict that by reason of its unrivalled simplicity and economy, this method will supercede all others for color toning on glass and celluloid.

The Term Anastigmat

SOMETIME shortly after the discovery of the Jena glass for photographic objectives a company of distinguished opticians were discussing the importance of the new invention and the topic turned upon the subject of flatness of field in lenses, and the mathematical conditions attending it.

The term "Anastigmat" was coined by Doctor Miethe, at that time a young experimenter in the optical field. The name took at once and spread over the entire optical world. Indeed, it seems even to have been appropriated, or, rather, mis-

appropriated, by many a maker of lenses, whose instruments are anything else than anastigmat.

Astigmatism is a term long known as well as coma and distortion, but in optical literature it did not appear much before 1827. It seems that the famous astronomer, Professor Airy, of England, is credited with the use of the term in a communication to the Cambridge Philosophical Society. His attention was called to the phenomenon by the appearance of the spider web in the Ramsden eye-piece of his telescope.

If the two cross-wires are situated in the center of the field, they focus simultaneously, but when these cross-wires are on the margins of the field, they need different adjustments of the eye-piece of the telescope to be focused sharply.

The main feature of astigmatism is such that the focusing of an object produced by an oblique cone of rays (which ought to be simultaneously sharp when free from astigmatism) is divided into two focal lines—one vertical to the other. One of these focal lines is directed to the axis.

In focusing these lines one after the other you will find that sometimes the line directed to the axis has the shortest focus, and sometimes the longest.

In the first place it is over-corrected, and in the second place under-corrected. Astigmatically, under-correction is that aberration which is adherent to a simple convex lens.

Over-correction is that adherent to a simple negative lens.

If a lens or system of lenses are so combined that the under-correction is balanced by over-correction astigmatically, then the lens is entitled to the name anastigmat.

In most cases it is not difficult to remove astigmatism entirely, but in many instances the over-correction astigmatism has been used to flatten the field, and people who are ignorant of this fact judge in a wrong way about the ability of the optician who constructed such a system.

An image flattened by astigmatism is better than even the otherwise most perfect curved image, as the former can be focused simultaneously over the whole field, whereas the curved image can only be focused in the center or in a circle concentric to the center of the field, which may finally extend to the margin of the field, according to the position of the lens to the plate or screen.

Radium—A New Element in the Safety Movement

RADIUM, the most mysterious and most powerful element known to science, which has the greatest power of all discovered sources of energy, has now been linked with the safety movement and will lend its power to the prevention of avoidable accidents. So great is its power that one gram is sufficient to raise a ton of water from the freezing to the boiling point. If one ton of it were harnessed to a ship equipped with 1,500 H. P. engines, the ship would be propelled at the rate of 15 knots an hour for thirty years.

Radium is best known to the world through its curative properties in the treatment of cancer and through its commercial value in making radium luminous material. The power of radium was made known only a few years ago through the efforts of a Polish woman scientist, and a French and an American professor.

Radium's rôle in industry as a life-saver is less spectacular, but perhaps even more important than it is as a therapeutic agent. The great mass of accidents in factories, in mines and in other industrial institutions where darkness is a creator of danger are being eliminated through the newest invention of science—radium luminous material. Radium-illuminated watches are familiar articles. The same material that illuminates these is now being employed in great factories on all power-line switches where fumbling might mean electrocution to the operator.

High-pressure gauges, which are installed as an insurance against dangers, are deprived of a great deal of their safety value through inconstant lighting. Their dependability as indicators is increased tremendously through making them safe 24 hours a day by the application of radium luminous material, which is invariably luminous in the dark. Steam gauges and water gauges of all sorts are making use of radium to increase safety.

Electric switches are often set in places which are unlit. This includes electric lighting equipment, which is usually visible only after the light it controls has been turned on. A spot of radium luminous material on the bottom of a switch makes them easily located in the dark, so that in emergency they may quickly be made use of.

Likewise, a fire alarm or a fire extinguisher is deprived of a good deal of its

efficiency through being invisible in the dark. Radium luminous material acts as a quick locator for them. Telephones which are often necessarily found quickly in the dark in emergencies, various emergency call bells, and revolvers are made more useful through the application of undark. Gun sights, illuminated, insure accuracy of aim in the dark. The need of luminating poison bottles, so that they may stand out warningly in the dark, has been demonstrated too often to need further dwelling on. An interesting safety device is the safe combination whose dial is radium luminated, so that no artificial light need be used for it.

The industrial uses of radium luminous material are many. Bolts that are necessarily attached to the dark underportions of machines and equipment are being touched with dabs of this luminous material, with a consequent great saving of bloodshed. In mines, where the carrying of oil lamps or the placing of electric-lighting equipment is not feasible, radium has been found to be a boon to humanity. There are dark corners in the dark underground channels which miners must traverse, corners where danger lurks—these are made safe through the unvarying luminosity of radium.

The value of radium to mariners is commencing to be recognized. Not only the compass dials, but the steering wheels, the gauges and other instruments which should be instantly and uninterruptedly visible have been touched with radium. Motorists, motorcyclists and the operators of any machinery which has indicating dials, or gauges which tell of the speed of the motor or the quantity and mixture of fuels and oils, are finding the solution of their difficulties in radium luminous material. The hazard of uncertainty has been reduced.

While radium is the most valuable element in the world—a gram of radium, which is about a thimbleful, costs \$120,000—as opposed to \$150 for an ounce of platinum. So powerful is it when mixed with other materials that even the minutest particle is effective in making material self-luminous for years. It is this quality which makes radium luminous material commercially possible.

The great value of radium is due to its scarcity, and to the great difficulty in isolating it after it has been found. Much of the radium of the world is now found in America, in carnotite fields. A great por-

tion of this comes from the Undark Radium mines in the Paradox Valley of Colorado.

The ore is found in narrow seams in the ground. It is sorted and packed in one hundred pound sacks and transported sixty miles to the nearest railroad station on the backs of burros and mules. Thence it is shipped in carload lots 2,900 miles across the continent to an extraction plant in Orange, N. J.

Two hundred fifty tons of ore treated with an equal amount of chemicals and water yields one gram, which is about the size of a pin head.

The power of radium lies in the penetrating character of its rays, which disintegrate and travel at the rate of 3,000 miles a quarter of a second.

In addition to the use of radium luminous material on machinery in industrial plants, it is used extensively for the marking of any corner or spot which should be visible in the dark. Angles of tables and chairs, corners in rooms, numbers to indicate cubby holes or doorways on which there is no other illumination are touched with a spot of undark. Even the valuable electric torch increases its efficiency when it has a touch of radium on it so that it can be reached instantly in an emergency in the dark.

When other lights fail, when fuses blow out, wires break down—radium will glow dependably without danger of explosion or of burning.

The employment of radium to help solve our medical and industrial problems of life safety is as yet in the first stages of its development. What the future will bring, no one knows.

Relation Between the Absorption and Sensitiveness of Dyed Plates

THE manifestation of luminescence indicates that very energetic vibratory movement is taking place in the disturbed molecules of the sensitive film, due undoubtedly to absorption of the incident rays of light on exposure of the plate.

The amplitude of the vibrations conditions the absorption and the energy is transformed either into heat waves or radiatory vibrations.

By fluorescence the latter factor plays the great rôle of absorption without light development, while heat is the factor in the former.

If a body is broken up by incident light, a decomposition takes place if, in conse-

quence of the absorption, the amplitude of vibration and the molecule has attained a certain magnitude. If, however, the amplitude remains under a certain degree, no decomposition can take place.

The value of the amplitude depends upon coefficient of greatness of absorption. If the absorption practically amounts to nothing, then the value of the amplitude is *nil* and likewise chemical action.

If, on the other hand, the *damping* is considerable, then the conversion of motion within the molecule takes place rapidly and, in spite of strong absorption, no decomposition is exhibited. Now this *damping* is apparently the greatest for the places of strongest absorption; therefore, if we sensitize a film with some suitable substance which affects the incident rays corresponding to this maximum, the maximum of sensitiveness may not appear there but somewhere adjacent. This is practically the theory laid down by Wiedeman.

Vogel previously demonstrated that sensitiveness occurs in those parts of the spectrum where there is absorption and affirmed further that the maxima of sensitiveness and absorption agree.

Abney maintained that sensitiveness agree throughout in their spectral position.

Bothamly remarked in a paper on the subject in the *Journal of Chemical Industry* (London) that when the absorption spectra (of gelatin films stained with dyes) thus observed are compared with the sensitizing action of the particular dyes, it is found that in every case the absorption band and the band of sensitizing effect correspond, but do not coincide. The point of sensitizing effect is nearer the red end of the spectrum than the point of maximum absorption. This is due to the association of the dye with the dense particles of silver bromide, the band being displaced towards the less refrangible end in accordance with Kundt's law.

When, however, the absorption-spectrum of the dyed gelatin bromide itself is examined, it is found that the absorption band and the sensitizing effect are absolutely coincident, a result which affords confirmation of the fact first proved by Draper, and firmly established by Vogel and others, that in order that light rays may produce any effect on a substance they must be absorbed by that substance.

Some experiments of J. B. Messerschmidt, who estimated the absorption-coefficient of a series of dyestuffs which

were dissolved in a variety of media, arrived at the conclusion that the absorption bands of the dyestuff have no fixed position in the spectrum, but that this is influenced considerably by the surrounding medium. With the increase of the density of the solvent the displacement of the absorption bands towards the red also increases. The positions of absorption and sensitiveness maxima estimated by him do not agree. He believed, however, that we can imagine a solvent so dense that the displacement of the absorption bands becomes so great that they will agree with the position of sensitizing action. He believed that this would be the case with the dense silver bromide.

Dr. Eder, in "Photographie mit Bromsilber Gelatin," says pretty much the same thing concerning the displacement of sensitizing action with reference to the absorption of the dyestuff itself. "Therefore, it is proved that the maximum of sensitiveness of dyed gelatino-bromide of silver plates is not identical with the maximum of absorption of the dyed gelatin, but that we must take into consideration the dyeing of the bromide of silver itself. It is now established that the silver bromide is dyed. For the explanation of the great displacement of the maximum of light absorption with reference to that of the photographic sensitizing effect of silver bromide Kundt's law may be quoted, according to which, in most cases, with the increase of the refracting power of the medium the absorption bands of the included dyestuffs are displaced towards the red end."

Smokeless Flash Powder

It is a well-known fact that when metallic magnesium, in a fine state of division, is ignited in oxygen it yields an intensive illuminant, extremely rich in chemical active rays. While the light of the sun is 524 times as bright in illuminating power as magnesium light, it is only 5 times more energetic in actinic force. So it happened very early in the history of photography that this means of powerful photographic illumination was brought into practical operation by experimentors, and we would have long ago have had flashlight exposure, instead of having to wait over thirty years for the means of its accomplishment.

The cause of this delay was due to the fact that the cost of production of metallic magnesium in the past made its employment prohibitive for burning purpose, and the

revival of interest in its use was caused by the discovery of cheaper methods of production, which brought its valuation below that of tin, and also to the improved mechanical plans for getting the metal in a very fine powder.

So about 1882 we find many suggestions made for increasing the energy of the product and advertisements galore of very efficient powders—with positive proof of what it is capable of in the shape of most excellent photographs.

The increase in efficiency of these powders was due to their constitution, based on the means of furnishing at the time of ignition to the powdered magnesium a rich supply of oxygen.

Excellent as were these early presented powders, further experiments made them still more efficient, until they gained wide circulation among practical workers, making photography independent of daylight.

One objection, however, to the use of flash powders is the annoying attendant smoke, the clouds of magnesium oxide formed during ignition. Mechanical devices, to be sure, have been put on the market to obviate this nuisance, but experiments more or less successful have been made to reduce the amount of smoke or to get rid of it altogether by compounding the powder accordingly—in other words, to make smokeless flash powder.

The chemical substances usually employed to deliver a flow of oxygen so as to produce an instantaneous flash are mostly salts, of potash base, like potassium permanganate, potassium chlorate, etc., which contribute much smoke.

Theoretically, we look for some body which by decomposition on association with the ignited magnesium will yield a gaseous product instead of a solid one.

The employment of the ammonium nitrate in association with the magnesium powder is suggested, inasmuch as this salt, by decomposition, yields gaseous products and practically little smoke. But there is this attendant disadvantage.

The ammonium nitrate, even in a dry state, is hygroscopic, that is, absorbs moisture from the air, and it is necessary to fuse it before compounding it, and to carefully preserve the mixed powder from moisture.

Furthermore, it does not act rapidly; if more than one part of the salt to one of magnesium is used, the powder is materially slowed down.

With this proportion, 40 grains of the powder was sufficient for a perfectly exposed negative in an ordinary sized dwelling room. The production of smoke was very small—so little that five successive exposures could be made before the necessity of getting rid of it.

For practical purpose the following constitution of the powder is recommended: 15 grains of finely powdered magnesium sifted from all coarse grains and 12 grains of ammonium nitrate. This gives a light on ignition (the powder being distributed on pyroxyline, or pyroxyline paper), which is sufficient intensity to make a fully exposed and good printing negative in a room 30 x 40 feet.

Effects of Weather Conditions on Dark-room Work

TECHNICIAN

Photographic work is greatly influenced by the weather, and though this may not apply to dark-room work in as large a degree as to outside operations, developing and printing are by no means immune from the effects of climatic changes.

The changes that matter are those in temperature and humidity. A drop in temperature is capable of upsetting development and retarding both fixation and washing, while damp can damage paper stocks and retard drying, and both can effect the operatives' health and energy. The obvious effect of temperature on development is seen in the speed with which the solution acts on exposures. A correctly exposed negative or print that would require X minutes to develop at one temperature, may require 2 or 3X minutes in the same solution at a colder degree. If this is forgotten when developing, under-development is almost certain, and in printing it invariably means over-exposure, as printers are often deceived into thinking the retarded image is due to under-exposure. If the developing formula contain any appreciable amount of potassium bromide, greenish prints are likely to be common, while if the restrainer is cut down to the minimum to avoid this, any bare exposures will be liable to stain from prolonged immersion. It is more difficult to gauge exposures when using cold developer than it is with solutions at a constant degree in the neighborhood of 65° Fahr.

With films we can safely increase the time if it is not possible to keep up the

temperature. With the necessary apparatus to heat tanks or dishes and keep them at a fixed temperature, all trouble on this score is done away with, but such apparatus is not in common use—nor, to my knowledge is it easy to get—and the next best thing is to have the whole work-room kept at a constant heat. In the printing-room this is certainly the best plan of all, but is not practicable everywhere owing to the absence of proper heating apparatus, and at times to the uncertainty of fuel supplies. Adding warm water to solutions is not of much use, as it weakens the solutions and only raises the temperature temporarily.

Where hydrochinone is in use a further consideration arises. This salt is more susceptible to changes of temperature than is the metol with which it is usually combined, and an M.-Q. formula will not give identical results at different temperatures. On a very cold day, an M.-Q. developer is to all intents and purposes a metol developer only, while the extreme opposite conditions, by rendering the hydrochinone more active than the metol, cause the developer to act as if an overdose of the former constituent had been put in.

Fixation is as much at the mercy of temperature as is development. I have recollections of a dark-room where a regular quantity of printing was turned out all the year round. The brands of paper, the formulæ, and the working method were constant and all the work was toned. Every winter thousands of prints were spoiled by double toning due to imperfect fixation, yet this trouble was unknown on warm days. I mention this case merely as an illustration of the greater difficulty of fixing in cold solution, not to argue that proper fixation is not possible under these conditions, because it is. Only it requires a greater amount of care and supervision. In this case the addition of a little hot water from time to time is of service, for the strength of a fixing bath need not be kept within rigid limits and weak warm hypo is better than hypo that is strong but very cold.

It is also useful to decrease the amount of hardener used, as the less hardening gelatine gets the better chance the hypo, and also the washing water, get of penetrating. Fortunately, the same amount of hardening is not necessary as in the summer, as the gelatine does not get so soft in cold weather.

Temperature effects washing water in two ways. First, its power of working in and out of the pores of the gelatine and the paper increases with the degree of temperature. This can be demonstrated by dipping a piece of gaslight or bromide paper in very cold water for a few seconds and an identical piece in very hot water for the same time. While the first will be merely wet, the other will be saturated and perhaps partially disintegrated. Secondly, the hotter the water the more rapidly will it dissolve chemical salts, therefore the hypo and other unwanted agents and by-products in print are more rapidly removed in summer than in winter. Certainly, the difference in time necessary to wash prints may not be very great, but it is always wise to take extra care of washing in cold weather.

The effects of humidity are not so obvious or so well defined as those of temperature, nevertheless they are not altogether to be neglected. It is generally accepted that damp destroys sensitive materials; but just what degree of damp becomes unsafe or how long it takes for it to penetrate boxes and wrappings are moot points. I know of two instances where gaslight papers of different makes were kept in perfect condition for years though very poorly wrapped, and in each case the room was exceptionally dry, and I think that the dryness of the rooms was responsible for the preservation, but of course this would need delicate experimenting to prove beyond doubt. It is certain though that a dry atmosphere is the best if one would be on the safe side, and where big stocks are carried it is wise to be on the safe side.

In process, humidity of the atmosphere can effect the drying of prints to some extent, but unless the degree of damp be very great this is not likely to be serious or even noticeable. On the other hand, extreme dryness can cause inconvenience by making prints curl up. This can be circumvented by collecting the prints before they reach the curling stage, or, if a drying machine is used, by economizing in heat.—*The Photographic Dealer.*

Action of Light on Ferric Salts

THE action of light in general upon metallic compounds is more in the direction of reduction, that is, the metallic salts which display the most striking photochemical phenomena are in most cases those

of the higher state, the per salts, which are reduced to lower state by the agency of light. Thus, for instance, the ferric salts in the presence of some active agent lose a part of the oxygen content and are converted into ferrous salts. Herschel worked out quite early in the history of photography a number of interesting processes with iron salts, which might repay some present attention.

Indeed, the Kallitype process is a revival of one of his formulæ. The ferro-prussiate process (blue print) we all are familiar with.

There is one method recorded by him which might well repay re-experimenting work. It is an improvement on the "Cyanotype," or blue print. One part by weight of ammonia citrate of iron (green scales) is dissolved in eleven parts of water and this is mixed with an equal quantity of a saturated cold solution of mercuric chloride (corrosive sublimate).

Before the precipitate has had time to form this solution is washed over paper and dried. This paper keeps for some time. Exposure to light yields a faint but distinct image. This is washed over as quickly as possible with a broad flat brush, or wad of cotton, dipped in a saturated solution of ferricyanide of potash diluted with three times its volume of gum arabic solution till the solution is just fluid enough to flow over the paper without the brush dragging on the paper. Wash over evenly and uniformly with one application. Beautiful pictures result, which should be soaked in weak hydrochloric acid (1-40) or in a weak solution of salt in water, and then finally washed and dried.

When light falls upon a ferric salt, say, perchloride of iron, and a solution of it in water is spread upon a paper and exposed to light, the presence of the organic matter in the paper, which absorbs the liberated oxygen, shows that a reducing action has taken place, due to the stimulus of light. No change is manifest when the action takes place and no organic matter present.

In making use of chemicals susceptible to influence of light, we must select some agent which acts as an intermediary. A body which merely acts as a reducing agent cannot be employed.

We want to have an unstable condition brought about by the action of the light so that a rearrangement shall take place and the part not acted upon remain unaffected.

For instance, with this ferric chloride

and organic matter of the paper, all the parts under the negative which are represented by the shadows of the original (clear glass more or less) will be affected in a greater degree than the more or less opaque high-lights and of a consequence when we examine the print from the frame and subject it to what might be called development, we make use of an agent which affects only the reduced salt, but no action on the unreduced.

Potassium ferricyanide, for instance, gives no precipitate with the ferric salts, but with the ferrous salts we get a permanent blue dye so simply in washing with water the exposed paper; under the negative we wash out the unaffected ferric salt and have a white ground of the paper.

In the case of the cupric salts we find the same process of reduction taking place. Mercuric chloride is also reduced and the uranic salts in contact with organic matter likewise. In this way we get media for the various printing processes.

Men—Too Much Neglected

It is a fact of common observation that the patrons of the photographer's studio are mostly women. Perhaps to some extent this is what might naturally be expected, representing the characteristic reaction of one sex as compared with the other to the picture idea, but study of the matter will show that the reason why a great many men do not patronize the photographer is simply that the latter has not used his head aright to get their business.

There are also signs that indicate a better field for "photographs for men" today than at any time in a good many years, if ever before. One of these is the increasing number of trade papers, house organs and other publications, illustrated with half-tones in the greatest profusion, occasioning constant calls for photographs of the members of various business organizations. A few short years ago, notoriety and fame were about the only things that would put a man's features on the printed page, but with the extensive business literature of today all this is changed. The field of publication has not only enlarged, but it has also subdivided, diversifying and reaching out in such a manner as to give each result-getter in his line his own little niche of fame or personal importance. Probably more than half the men who sit for their pictures today do so to satisfy the demand

of some one who is getting out a magazine or booklet or something similar for business purposes.

This matter of photographing men being, therefore, one which should interest every one who conducts a studio or shares the tasks therein, we venture to present a few points in regard to it, the consideration of which may help the photographer in attracting this business to himself.

1. Men are as good prospects for photographs as women, but to a larger extent they need to be *sold* on the proposition. A woman takes naturally to the idea of sitting for her portrait, whereas a man is more likely to dismiss the idea with a laugh as soon as it is suggested. Perhaps because a laugh of mockery is for most people hard to stand up to, many photographers take this rebuff more seriously than they should. It is generally no more than what is thought to be the correct conventional attitude for a man to take in regard to his picture, and behind it is a hidden willingness to be convinced. Go after a man prospect "hammer and tongs," respond to his raillery in kind, make out a case for his wanting a portrait without its seeming the sign of his being a conceited ass about his looks—and you've got him. Underneath, he is just as vain about his looks as the average woman, but he is ten times less willing that any one should know it.

2. By and large, men are good pay, and do not haggle over prices. Also, because they are constantly dealing with matters of finance and business routine, they respond more readily than women to accepted methods of collections.

3. Because men assume a different attitude toward portraiture than do women, and also because they are different in their habits and reactions in a multitude of ways, they must be handled in a different manner. The approach to the studio and the "operating room" (what a term!) must be made easier and more natural to them. A woman will announce an appointment for a sitting as calmly and naturally as she will announce an appointment with the dentist, but a man would as soon announce that he is in love. In fact, he has been so much neglected in this matter that he generally thinks it is something he should almost be ashamed of. His method is to slip off to the photographer on the quiet and get the thing over with before his friends can have a chance to see what foolishness he has been up to. In the

studio itself, where women feel naturally at home, he is likely to feel that he is encroaching on the feminine sphere, and sometimes he is hardly in before he wishes to get out. All of which is more self-consciousness than anything else, due to the fact that photographers have so largely passed him over, and suggests the importance of giving some study to his case. Have a thought for him in the arrangements of the reception-room. Strive to create the impression that he is only one of a great many real he-men who come to you for this kind of thing, and that to have a portrait made is as normal as to have a shave. In other words, disarm his apprehension that he is acting like a fish out of water; make him feel at ease.

4. Women wish to look beautiful in their pictures, but men wish chiefly to look forceful. This difference goes deep, and makes the posing of men a matter that requires special study by photographers of women. Seek always to elicit those expressions which suggest positive, aggressive character and a self-reliant manner.

5. Men do not take as kindly as women to the idea of displaying their pictures in a showcase.

6. Finally, the efforts to get business from men must be more direct than in the case of women. Partly because they are engrossed with their affairs during most of the day, they do not respond as readily to a general advertisement, and must be gone after by more intensive methods. Some photographers, realizing the difficulty of getting men into their studios, have specialized in photographing them in their offices, at their desks. There is no question that any amount of business awaits the photographer who will shake himself loose from habit sufficiently to go into the thing upon this basis. Often all that is needed is a preliminary call for purposes of solicitation, tackling the head of the concern first and arranging with him to photograph all the important members of the organization. A few years ago this would not have been practical except in some exceptional cases, but the business uses of portraits of business men are so much more numerous today, as was stated at the outset, that the suggestion is now often welcomed as a convenience where formerly it would have been regarded as an intrusion. There is another point in favor of this method of attack. Men are strong on team-work, and it is sometimes

much easier to get them to go into a thing all together than to sell them individually on the proposition.

7. Finally, think this over: Would the published pictures of men so often reveal a necktie or a collar or a general style of beauty about ten years out of date if photographers were fully on their jobs?—*Portrait.*

Chemical Nomenclature and Pronunciation

By J. NORMAN TAYLOR

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THE attention of educators is frequently called to the responsibility of secondary schools in the matter of preparing students for institutions of higher learning. Slow progress in college is attributed to lack of proper training in the student's preparatory life and not infrequently, failure in later life is ascribed to faults of secondary schools. A well-known research director, in writing of the lack of observation among chemists, states that "until a conscious effort is made in our primary education to meet this requirement, our advance in science will not be as speedy as it should" (Robert E. Rose, "The Education of the Research Chemist," *Jour. Ind. and Eng. Chem.*, 1920, xii, 948). A prominent educator implies this same lack of adequate preparation when he says, "And even if a freshman is somewhat dulled by his previous training, that seems scarcely a good reason for going on with the dulling process" (C. G. MacArthur: "The Scientific Teaching of Science," *Science*, new ser., 1920, lii, 350). Not only as regards preparation in science is deficiency laid at the door of the secondary school, but the poor English employed by so many college graduates is likewise charged to the same source. "A university graduate's inaptitude in the art of writing may be due, however, not to faults in his university course; more likely it is due in part to inefficient methods employed in the schools in which he obtained his earlier training in English" (George McLane Wood: "Suggestions to Authors," *U. S. Geological Survey*, 1916, p. 52).

Granting the fact that the lower schools are responsible for deficiencies which handicap the individual later on, it will be agreed that in secondary schools, method is of great importance. If we are to utilize

the scientific method in teaching science, then it follows that in English-speaking countries good English, both with regard to spelling and pronunciation, should be used to convey our thoughts regarding science.

Although, perhaps, not a vital matter, it nevertheless appears to the writer that in teaching chemistry, the nomenclature used in secondary schools, so far as chemical words and terms are concerned, should agree with that employed in the higher institutions of learning. Dean Wilbur, in speaking of good use in language, with particular reference to national use, says, "There is a law of national use that restricts us to those words that are in good use throughout the land. . . . A word that is not in good current use throughout the land is inefficient. Misunderstanding and perplexity and vagueness follow in the track of such a word" (William Allen Wilbur, "English Rhetoric," Judd and Detweiler, Inc., Washington, 1917, p. 260). In instances where chemical facts have been conveyed to the preparatory school student through the medium of corrupt English, confusion is bound to follow when his teacher in college uses pure English. And a change from pure English to corrupt forms is equally confusing. Certainly, there should not be any confusion in this regard and greater uniformity should obtain both as to terminology and pronunciation.

If it is correct to spell the word phosphorous with "ph," why should not the same principle in orthography be followed when writing the word sulphur? Good English would require that the names of the members of the halogen group be spelled with the final "e," as "fluorine," "chlorine," "bromine" and "iodine," and that they be pronounced as they are spelled and not as though the termination were "in." Likewise good English demands that the names of the chemical compounds known as the halides be spelled with the final "e" and that they be pronounced as they are spelled (consult "Inorganic Nomenclature" in the introduction to a "German-English Dictionary for Chemists," by Austin M. Patterson, published by John Wiley & Sons, Inc., New York, 1917). The names of analogous compounds should terminate in "ide," as for example: carbide, oxide, sulphide, phosphide, nitride, selenide. The names of these compounds should not be pronounced as though they terminated in "id." Acids, bases and salts

should be written and pronounced with a proper regard for good English (examples of good chemical nomenclature are to be found in "A Dictionary of Chemical Terms," by James F. Couch, published by D. VanNostrand Co., New York, 1920). In naming salts, the negative terminations should be "ate" and "ite" and the names should be pronounced as they are spelled and not as though they terminated in "at" and "it."

We must conclude with Dr. Crane that "good English in chemical literature, particularly in naming compounds, needs cultivation" (E. J. Crane, "Chemical Nomenclature," *Jour. Ind. and Eng. Chem.*, 1919, xi, 72). Its choice is based on a proper regard for derivation and good usage, and this latter desideratum requires the use of pure English by English-speaking people, both in writing and pronunciation. Elimination of un-English terminology in chemical literature may be brought about by following Dean Wilbur's injunction: "Cultivate your own heritage. Cast away your mannerisms and discard your provincialisms, but cherish as a trust your own style and express it in our common language for the common good." Let those who teach chemistry in our schools and colleges observe good usage and adhere strictly to real English rather than to individual preferences.—*School of Science and Mathematics*, U. S. A., December, 1920.

Cleaning Dishes

THE photographer has to exercise quite abnormal carefulness and neatness if the corners of his dishes are to be as clean as the other parts. This is seen clearly enough in the case of the white granite dishes, and no doubt holds true enough of the vulcanite and compo dishes, the color of which prevents any dirt that is present from being conspicuous. The reason, of course, is that when the dish is scrubbed out in the ordinary cleansing, the brush or whatever is used does not go right into the corners, or if it does, it does not scrub them with so stiff a fiber as it does the more exposed parts. The only brush I have found of much use is the short, round, stiff one known as a stencil brush. This is very cheap. One figures beside my sink, and whenever a dish is washed, this brush is pushed well into each corner in turn, and twizzled round. No dirt that has not been allowed to dry on, nor much that has, can resist it.—*T. Richmond.*

Process Film for Photographing Lace and Similar Fabrics

THERE are times when the photographer is called upon to photograph samples or specimens of lace or fabrics of a similar kind, for either exhibition or catalogue purposes. To obtain the best results, it is necessary to produce a negative of considerable contrast. Not only will this class of negative show the lace to the best advantage as a photograph, but it will prove to be the best for the production of prints for reproduction by the half-tone process, although the better plan by far is to reproduce the photograph of such articles in *line*, because 50 per cent. of the dark portions are lost by the half-tone process, which causes the final print to appear weak instead of being well pronounced.

Of course good photographs may be produced by the use of an ordinary or Commercial Film, yet the best and most suitable results are to be obtained by the Process Film.

It has often been remarked that the best kind of background suited to back the lace is black silk velvet. The writer has found that the dead black paper in which the films are wrapped is admirably suited for the purpose; in fact, the specimens accompanying this description were photographed by using this paper for a background.

One of the troublesome points to contend with, in photographing lace and embroidery work, lies in getting the article to lie straight. The usual method adopted is to tack them down upon a smooth board covered with dead black paper or black silk velvet, with small pins. This method, however, is objectionable because of the difficulty experienced in getting the lace to lie straight, so as to form no irregularity of line or altering of the width of the lace by stretching. A better method may be adopted by attaching to a smoothly planed soft board a sheet of matt black paper, by means of common glue. The paper must be well wetted, by placing it in a tray of water, and blotted, then brushed evenly all over with glue, the board being treated in the same way, after it has been well warmed over a gas stove. The glued paper is then laid carefully down, commencing at the middle and lowering each end; it may then be well rolled down by means of a roller, or pressed down by a squeegee, taking care to lay a sheet of paper upon this previous to applying the roller or squeegee. This

procedure will ensure the glued paper being firmly attached to the board, free from lumps or air bubbles. When this has become thoroughly dry, the surface of the black paper may be brushed all over with rubber tire cement, thinned down with benzine, using equal parts of each. As soon as this coating has become well set, it must be brushed over with a second coating, which, when dried down, will present a surface just sufficiently adhesive to hold the lace, when it is laid upon it, without in the least degree injuring it. The lace may be pulled slightly so as to secure a straight line; then, by pressing upon it with the fingers, there will be just enough tackiness to hold it in position, without fear of its shifting. The way to prepare a board or boards by this method is to allow the rubber surface to stand over night, so that it becomes well set. Then there will remain a surface tackiness that will last for two or three weeks without renewal. This tackiness is not so pronounced as to present the sticky quality of glue. It possesses just sufficient adhesive quality so that when any material is pressed upon it, it holds without injury to the object to be photographed.

As soon as the negative has been made, the lace may be removed by pulling one end, without the slightest detriment to it. The lace shown in our illustrations was held in place by the means described.

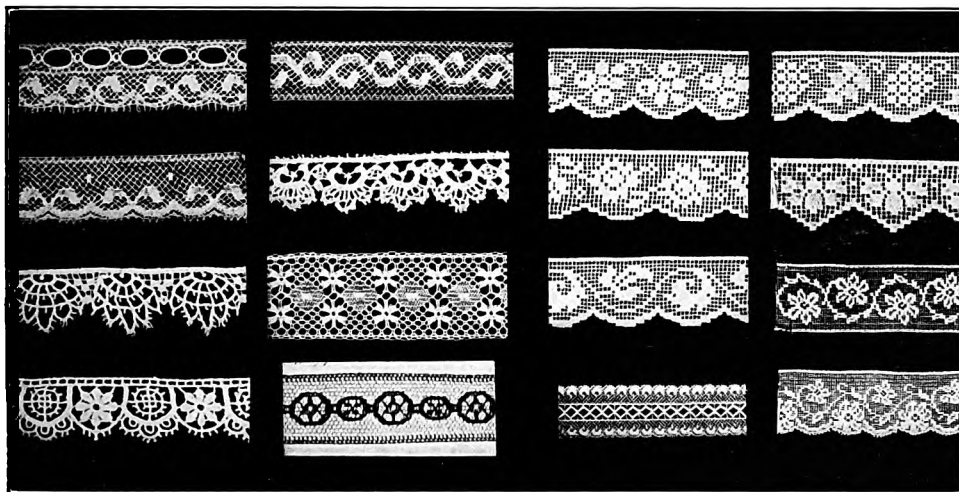
Pinning lace to a board is a very tedious piece of work and runs into cost for time, that cuts severely into the profit of the photographic work when finished. The object of a board of soft wood is, that it may be used at any time for attaching any article with pins, which are easily pushed into the soft wood and as easily removed.

At times there may be some difficulty in procuring a fair size sheet of black paper, say, 8 x 10, with a perfectly even surface. This may be readily obtained by exposing a sheet of 8 x 10 hard Azo for five or six seconds, fully developing, fixing and washing in the usual way. As soon as this sheet of paper is dry, a matted surface may be easily produced by rubbing a small quantity of very fine pumice powder all over the surface with the fingers, dusting the remaining pumice off, and carefully wiping the roughened surface all over with the palm of the hand. If a fine black even surface is desired, with a slight gloss, the developed paper may be used untouched by the pumice. If the photographer has some matt surface paper at hand, this may

be treated in the same manner as far as exposure and development is concerned; then a dead black matt surface will be attained without the use of pumice powder. The black background of the samples of lace illustrated here was made from F. Hard Azo, exposed and developed as described.

In the production of photographs of lace, embroidery and similar material, it will be found that the F. Hard X paper is well suited for the purpose, because a perfect white print results upon a jet black ground, or black lace is rendered upon a clean white ground, as may be seen in the present illustration. If it is desired to

these appliances, gas burners may be used within reflectors. The interior of the reflectors may be painted with a matt white oil paint, to secure even reflection, or they may be brushed over with a mixture of dental plaster of Paris, mixed to the consistency of paint, giving a second coating after the first one has become dry and hard, or another material may be used, which answers admirably, namely, a coating of aluminum paint. The reflecting property of this paint is very remarkable. The interior of electric arc light reflectors, so coated, give every satisfaction. All these interior reflecting surfaces have been put into practical use; the plaster of Paris



PROCESS FILM NEGATIVE, MADE AS DESCRIBED

produce prints somewhat softer in effect, all that need be done is to dilute the developer, then by carefully watching the development, the desired result will be easily attained. The above remarks apply equally to the photographing of medals, cameos and like articles, which should be illuminated principally by a side light. Lace and such material should be illuminated by a direct front light, or by lighting from each side, as in the case of using two electric arc lamps. Where much of this class of work has to be done, daylight is preferable; where, however, artificial light must be employed, then two 500-watt tungsten electric lamps may be employed, fitted into two suitable reflectors, or, in lieu of

mixed with water paint, and the aluminum paint take the lead for every day use.

The oil mixed paint invariably becomes yellow in a short time, which alters the time of exposure considerably, although in the photographing of such material as white lace, the time of exposure is not of a serious nature. If other objects are to be photographed, the shadows or dark portions cause too much contrast through the reflected yellow light.

A copy board coated with the rubber cement is very useful for the temporary mounting of letters, legal documents, etc. They will adhere firmly to the board while being copied and can then be stripped off without injury.—*Photographic Poster.*

Patents

X-ray plate holders [and intensifying screens]. Siemens und Halske A.-G. E. P. 143, 261, 3.7.17.

AN enhanced intensifying effect, dependent on the emission of secondary radiation by bodies exposed to primary X-rays, is obtained by backing up the sensitive film by a composite screen containing elements of varying atomic weights, the lighter elements being nearer the sensitive film. For example, a screen may consist of 2 or 3 layers of tin foil, a layer of mercurous iodide, and a layer of lead, the tin foil being in contact with the sensitive surface of the plate. The graininess of the ordinary intensifying screen composed of a mineral salt is avoided.

Silver compounds and products; Process of reducing the [light-] sensitiveness of —. N. Sulzberger. U. S. P. 1,356,236, 19.10.20. Appl., 26.4.15. Renewed 7.9.20.

THE light-sensitiveness of photographic silver compounds is reduced by treatment with a solution of a soluble ferrocyanide.

1,365,999. *Multiplying Camera.* In a camera having lens and light chambers, a laterally movable slide upon which the said lens and light chambers are supported, a box adapted to support a roll film, said

1,368,029. *Autographic Film-pack.* The combination of a casing having an exposure opening, a series of films arranged in a pack opposite said opening, means for exposing said films successively, and means for permitting the autographing the body portions of said films while in said casing.

1,367,960. *Anastigmatic Lens.* An anastigmatic lens, having a face formed of warped, mitered surfaces, and an opposed convex face, whereby light is refracted simultaneously in right-angled placed planes and through all intermediate radial and other planes,

1,368,210. *Camera.* A film camera including a spring-actuated receiving roll, a shaft having discs provided with teeth to engage openings in the film, a stop disc having a crescent-shaped stop, a pin projecting from one of the two discs to engage said stop, and means for tripping the disc to release the stop.

box being a part of the camera structure and into which the light chamber is projected, said roll film supporting box being adjustable laterally relative to the light chamber, and means for imparting focusing movements to said roll film supporting box whereby two or more transverse rolls of exposures may be obtained on a roll film.

1,368,608. *Photographic Diaphragm.* A photographic diaphragm, consisting of a plate having a plurality of minute holes disposed therein about the center and a series of elongated arcuate openings arranged about said minute holes equidistantly from the center.

1,366,876. *Photographic Camera.* A camera casing for film rolls having an exposure field in its front, laterally movable curtains to control the exposure field, means at the ends of the curtains coacting with the casing to give proper support to the curtains and direct them in their movements when adjusting the exposure field, a shaft paralleling the exposure field and disposed at one side thereof and having its end portions oppositely threaded, and connecting means between the edges of the respective curtains and the threaded end portions of the said shaft.

1,368,880. *Portrait Photography.* The improved portrait photography apparatus for use with special image plates, each bearing a plurality of rows of miniature images of the subject, the same comprising in combination, a frame suitably supported between the light projecting means, and the print holding means, a carriage adjustably and freely at will shiftable transversely on the frame, a first index device indicating the position of the carriage on the frame, an edge piece adapted to carry and engage the image plate in a predetermined relation, said carriage constructed to support said edge piece with image plate so as to be adjustably and freely at will shiftable longitudinally with respect to the carriage, and a second index device indicating the position of the plate in the carriage; whereby a plural-row positive image plate may first be inserted, shifted longitudinally and transversely to select a desirable image, its position noted by said two index devices, and then replaced by the corresponding negative plate for printing a portrait from the corresponding image.

1,366,748. *Photograph-Development Apparatus*. In a photographic-developing machine, the combination of a row of tanks of different sizes, a plurality of parallel guide rollers mounted over said tanks, a plurality of guide rollers mounted in the tanks near the bottoms thereof, means to cause a strip of photographic prints to travel continuously over the upper rollers and under the lower rollers, pressure rollers above each of those rollers in the upper set over which the photographic strip passes as it emerges from the several tanks,— which pressure rollers exert downward pressure on said strip as it passes between it and the associated roller whereby to squeeze out of the paper strip and discharge back into the tank from which it came the excess solution carried by said paper strip.

1,368,860. *Moving-Picture Camera and Projector*. A moving-picture camera for household use comprising a casing, a tube extending through one wall of said casing, a lens carried by said tube, a crank arranged exteriorly of the casing, a power shaft connected with the crank, said shaft being principally within the casing, a film guide for guiding the film past said lens, intermittent feed for the film, a pair of driving rollers for moving the film from a supply to the guide, means connecting said power shaft with said driving rollers and with the intermittent feed for operating the same, a deflector for guiding the exposed film to said driving rollers, and means for receiving the exposed film as it leaves said driving rollers.

1,368,614. *Autographic Camera*. A camera comprising a body having a chamber for receiving the sensitized element, a light-projecting chamber, and a passage leading through a forward wall of the body so as to admit light to the front surface of the sensitized element, said passage being located outside of the light-projecting chamber and opening into the first-mentioned chamber, a writing tablet movable into and along said passage so as to overlie a portion of the front side of said element, means for controlling the admission of light to said element through the passage and the tablet, a backing member in the camera between which and the tablet the film is pressed and means for pressing the sensitized element between said backing member and tablet, substantially as and for the purpose set forth.

Photographic Materials and Processes

Panchromatic sensitiveness without dyes; Production of —. J. G. Capstaff and E. R. Bullock. Communication No. 92 from Eastman Kodak Research Laboratory. Brit. J. Phot., 1920, 67, 719–720.

THE fog obtained on the development of some specially treated plates was found to be due to color-sensitizing of the film followed by fogging by the dark-room lamp. The color-sensitizing was produced by a preliminary bathing in a solution of sodium bisulphite and subsequent thorough washing; the degree of sensitizing increases with the length of washing up to certain limits dependent on temperature and other conditions. Washing with distilled water is not effective nor is washing with tap water without the preliminary treatment. Addition of alkali to the washing water, or a separate bath of alkali, increases the sensitizing effect, and washing in neutral potassium bicarbonate solution is more effective still. Very small quantities of chlorides and bromides in the washing water, but not in the bisulphite bath, reduce the effect. Sensitizing is also produced by a preliminary bath of sulphurous acid, but not by one of normal sodium sulphite. The sensitizing effect obtained extends to $\gamma = 800\mu$.

Photographic deposits; Measurement of graininess in —. L. A. Jones and N. Deisch. Communication No. 99 from Eastman Kodak Research Laboratory. Journ. Franklin Inst., Nov., 1920, p. 657.

By graininess is meant a visual appearance in a photographic negative or positive of a lack of homogeneity in the silver deposit. It may be due to the size and distribution of the individual particles when viewed under high magnification, to the grouping of the particles in clumps, under small magnification as in projection or enlargement, or to the further agglomeration of the clumps, visible to the unaided eye. The second form is the one chiefly dealt with. An apparatus is described by means of which it is possible to obtain a number to express graininess which is reasonably free from subjective influence. An image of the object under examination is projected by means of a microscope, giving known and adjustable magnification, on to a screen of magnesium carbonate alongside another patch of the screen illuminated by a light of controlled intensity. The two

patches are viewed through a mirror, the distance of which can be adjusted until the grainy appearance of the image first disappears. The standard for comparison is a cross-ruled screen, 500 lines to the inch. If D_1 , M_1 are the distance and magnification respectively of the cross-line screen, D_2 , M_2 those of the object, N the ruling of the screen, and E the ruling equivalent to the object, then the graininess being inversely proportional to E is $10^6 M_2 D_1 / N M_1 D_2$, the constant 10^6 being arbitrarily chosen. Graininess generally varies with density; observations are therefore usually made on photometric strips and logs, graininess plotted against density. Graininess also varies with γ , the degree of development, but this has not been fully examined. The shape of the graininess-density curve is constant for a given batch of emulsion and approximately so for different batches of a given emulsion, but varies greatly with different emulsions. Graininess varies considerably with different developers, although not appreciably with changes of bromide or of temperature for the same developer. Of two pyro developers examined the less alkaline gave the less graininess, while of three quinol-carbonate developers the least alkaline gave the most graininess, but a caustic quinol developer gave still more graininess. As the size of the individual grain is independent of the developer used, graininess cannot be a function of grain-size.

Combined Developing and Fixing

FRENCH photographers seem to be especially interested in bizarre processes, and among these have investigated the methods by which the developing and fixing agents are combined in one solution. They have also given attention to processes in which fixation precedes development, a curious and interesting reversal of the usual method, and one that has been but little considered by the writers on the latent image. Lumière Brothers and Seyewetz have been especially active in researches along this line, and in a recent communication to the French Society of Photography (*Bull. Soc. Franc. d. Phot.*, Nov., 1920, reprinted in *Photo-Revue*, 1921, 5) give some new methods for using combined baths. After a review of the literature and pointing out some unsatisfactory methods, they give two solutions which they claim will give good results. These are:

FORMULA NO. 1

Water	1,000 c.c. (1 quart)
Sodium sulphite .	32 grm. (1 oz.)
Chloranol	6 grm. (90 grs.)
Sodium hydroxide	5 grm. (75 grs.)
Hypo	60 grm. (2 oz.)

FORMULA NO. 2

Water.....	1,000 c.c.
Sodium sulphite	32 grm.
Metotoquinone	6 grm.
Tribasic sodium phosphate.	100 grm.
Hypo	40 grm.

The sodium sulphite is the ordinary anhydrous form. The sodium phosphate is the one in which all the hydrogen of the acid is replaced, being Na_3PO_4 , and not the common form sold in drug stores. In formula No. 1, the sodium hydroxide can be replaced by 140 grm. of the tribasic phosphate and the hypo reduced to 48 grm.

The writers claim that these formulæ will give negatives of entirely satisfactory character, and are especially applicable to cases of over-exposure. The duration of the process is from 20 to 25 minutes and is automatic, taking place equally well with vertical or horizontal position of the plate. Papers require only about two minutes. They also claim that the procedure does not require a special method of illuminating the room in which the operation is conducted. A greater or less duration of the process does not imperil the value of the negative.

Metotoquinone is stated to be composed of two molecular weights of methyl-*para*-aminophenol and one molecular weight of hydroquinone, and chloranol is composed of two molecular weights of methyl-*para*-aminophenol and one molecular weight of chlorhydroquinone. Both these substances share with *para*-aminophenol the property of developing without the addition of alkali, but alkali may be added as accelerator.

With chlorbromid papers it is advisable to double the time of exposure, and the action of the bath should not be continued beyond two minutes or the purity of the image will be diminished. Papers containing only silver bromide cannot be developed by these methods, as they become markedly veiled. The addition of potassium bromide does not prevent this action.—H. L.

If old negatives are soaked for a few minutes, the film will shave off with the aid of an old safety razor blade. Going over once removes the bulk, and a second run over any obstinate patches.—F. N.

A New Sensitizing Method for Chromated Gelatin

IN the recently issued (23d) volume of *Penrose's Annual*, a translation is given of an article by Professor R. Namias, of Milan, describing a method of preparing chromated gelatin surfaces which have better keeping qualities than those prepared by the common method. The essential feature of the method is the use of neutral chromates with sodium carbonate. When neutral chromate is used alone, the gelatin mixture is but feebly sensitive. The incorporation of alkali-carbonates, such as sodium carbonate, diminishes the sensitiveness and free alkalis diminish it still more. On the contrary, what sensitiveness these mixtures have are retained longer than when the dichromate (so-called bichromate) is used. Namias has found that a mixture of gelatin, neutral chromate and sodium carbonate, may be kept for some time, and, when desired for use, the sensitiveness may be greatly increased by fuming the surface with strong acetic acid. This procedure is carried out very much as the old ammonia fuming of silver paper was done. A small amount of very strong acetic acid is placed in a dish, which is set in a wooden box that can be closed light-tight, and the paper to be fumed is suspended, coated surface down, a short distance above the acid. The box being closed, the fumes are allowed to act for half an hour.

Namias states that he has as yet made no experiment with gum-paper, but it seems likely that similar results will be obtained. One advantage that may result from the method is that gum and gelatin paper may be manufactured for general sale, to be sensitized when wanted.—H. L.

Glycin as a Stock Developer

E. VANNIER (*Photo-Revue*, 1921, 33, 10) has found that a strong solution of glycin can be made up and portions diluted as wanted, giving much convenience to occasional workers. He gives the following formula:

Water	250 c.c.	(8 fl. oz.)
Sodium sulphite		
(dry)	25 grm.	(1 oz.)
Potassium carbon-		
ate	20 grm.	(¾ oz.)
Glycin	10 grm.	(150 grs.)

The substances should be dissolved in the order indicated. It is very likely that

dry sodium carbonate can be substituted for the potassium carbonate without detriment to the solution. For development it is best to prepare two baths, as follows:

SOFT BATH

Stock solution	15 c.c.	(½ fl. oz.)
Water enough to		
make	150 c.c.	(5 fl. oz.)

HARD BATH

Stock solution ...	25 c.c.	(1 fl. oz.)
Water enough to		
make	100 c.c.	(3½ fl. oz.)
10% potassium bro-		
mise solution ..	10 drops	(10 drops)

Begin the development in the soft bath and transfer the plate to the hard bath only when there is need of material increase in intensity. The bath may be used until exhausted. Its activity may be increased by the addition of 10 drops of a 15 per cent. solution of caustic soda, or by addition of a small amount of metol, which should be added to the water used in making up the bath, before adding the other ingredients. It is claimed that this method enables good negatives to be obtained under markedly different conditions of exposure, but plates much over-exposed require treatment in the hard bath.—H. L.

Further Note on Development in Ordinary Light

THE process of Dr. Lüppo-Cramer, in which a bath of phenosafranin is used to diminish the sensitiveness of plates—described in the February issue of this journal—has been improved by Dr. König, so as to enable the removal of red stain from the film to be made more quickly. The procedure is to soak the fixed and washed plate in a solution prepared by mixing—

Water	100 c.c.	(3 fl. oz.)
Sodium nitrate...	0.5 grm.	(7 grains)
Muriatic acid ...	5 c.c.	(1 fl. dram)

The plate is allowed to remain in this bath until the color changes to blue, which generally requires only a few seconds. The color can be readily washed out. Note that sodium nitrite, not nitrate, is directed.

Phenosafranin is now a commercial article in Germany, being sold in 10-gram packages at 10 marks per package. It will probably be soon available in the American market, if not already obtainable from the firms making synthetic colors for biologic uses.—H. L.

Optical Efficiency of the Lens

THE efficiency of the lens, as far as it relates to its application in photography, must be estimated by the accuracy with which the various aberrations are corrected for the extent of field covered by it.

The angle of view is generally understood to be the angle included between the lines drawn from opposite ends of the diameter of the circular field of the lens; that is, from the diagonal of the plate.

"Narrow angle" and "wide angle" are the terms employed to designate the maximum ability of the lens; and, while a long-focus (narrow-angle) lens could hardly be called upon to act as a wide-angle lens, the so-called "wide-angle" (short-focus) lens may function as wide, medium or even narrow angle, according to the area of plate presented to it.

To be sure, this property of "covering power" must be considered in connection with the purpose to which the lens is to be applied, because the requirements in respect of extent of field are so varied that comparison is made difficult. The lens primarily must be adapted for covering to give equality of illumination.

Inequality of illumination is occasioned, first, because the diaphragm of the lens acts as though it were contracted in area when admitting oblique rays, narrowing down; second, the distance from diaphragm to plate is always greater for oblique rays than for parallel ones, hence the intensity of the admitted light through the lens is diminished as the square of this distance.

Bear in mind that the area of illumination by the lens is circular and its diameter determines what size plate can be got out of this circle; in other words, inscribed on this circle. Laying aside consideration of quality of image produced from center to margin of such an area, and taking into account the illumination of the corners, the diameter of this circle equals the diagonal of any plate (measured from corner to corner) which will be lighted to the corners, say, in $6\frac{1}{2} \times 8\frac{1}{2}$ plate, the diagonal is $10\frac{1}{2}$ inches; then no lens giving a less area of illumination than $10\frac{1}{2}$ will cover the $6\frac{1}{2} \times 8\frac{1}{2}$ plate.

Ascertain the diameter of the area of illumination of your lens and draw this on a piece of paper then by placing any plate you wish to use upon this circle. You may, at a glance, determine whether your lens will cover.

When very wide-angle lenses are used, the loss at the edges of the plate is most noticeable, and it is often necessary to make use of devices to get rid of this inequality of illumination. The principle upon which they effect equalization is in the cutting out of axial rays more than marginal rays.

You must bear in mind that the projection of a circle by the lense is always elliptical, so that the pencil of illumination undergoes a complicated change of form in passing from the center towards the edges of the plate, or the ground-glass, hence it is necessary to calculate the amount of diminution of light, due to the fact that the transparent disc of the lens is seen in this ellipse, which necessarily decreases in diameter in passing from center to circumference of the circle of illumination.

Our sources of illumination in photography are not from simple points of light, but from different areas reflected from the image, so in practice the luminosity of each of these parts of the image must be inversely proportional to the square of the focal length for that point of the screen. So approximately, efficiency is inversely proportional to the square of the distance from the lens. The photographer in testing the covering power must bear in mind that it cannot be expected to cover even its own dimensions, unless it be directly opposite the center of the plate.

If the lens is moved up or down, right or left, out of the center, you move at the same time the field of definition, and so parts of the plate are bound to fall off.

The covering power of lenses varies greatly, but the skill of the optician enables him to get fine definition over a wide field. A consideration of these means is not here in order, but we offer as final advice, that the larger the circle covered by the lens of given focal length, the better, because such a lens may be moved about on the front board of the camera without risk of getting ill-defined corners on the plate.

To Work with Crayon on Bromide Prints

USE powdered pumic-stone to roughen the surface slightly, sprinkling the powder on the paper and rubbing lightly with the palm of the hand. This gives a good tooth for the crayon, but care must be taken not to make abrasions on the paper by too vigorous rubbing.

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PICTORIAL "EFFECTS," AND WHEN TO FIND THEM—WILLIAM S. DAVIS

IN the hunt for subjects which may yield pictorial results, it is important to learn *when*, as well as where, to look; for, in nine cases out of ten, the beauty of a finished picture depends less upon what might be called the natural quality of the objects entering the composition than the character imparted by transient "effects," due to the play of light and shadow, fog and mist, and clouds; these emphasizing one part, while subduing another, and, in general, creating an entirely different arrangement of tonal spots and masses with each change in conditions.

Before going further, we should, perhaps, explain for the beginner's benefit, the most essential elements entering into a picture which may make it an artistic production. To most people, untrained in art matters, the "subject," and what it tells is all that matters—how the material is rendered seldom being given serious thought. It is from this point of view that thousands of casual snapshots are made every day—photographs which violate many, if not all of the basic principles of pictorial expression, such as have been formulated upon the experience of the legions of artistic workers of the past. Briefly, these principles upon which a picture should be constructed can be set down as follows: A picture should show unity of expression by so co-ordinating separate parts that a focus of interest is established, toward which the eye will unconsciously travel. The light and dark tones must balance one another in such a manner that no portion of the picture will appear top-heavy or one-sided in the weight of tone. The distribution of these tonal units, in a successful picture, will present a pleasing abstract "pattern," in the same sense that a conventional design in a rug is pleasing to the eye, independently of what the material represents. This combination of the elements in a scene to form a pattern of agreeable design,

and express the idea or "motif" for the picture is covered by the general term "composition." Other points which call for thought is the representation of the varied tonal gradations of the scene by relatively truthful tones in the picture, these being referred to, collectively, as "values"; meaning that the tones in the picture correspond in their relation to one another in the same manner as those of nature stand to each other. Proper rendition of values gives the feeling of light and atmosphere, which, in turn, conveys the sense of depth between foreground and distance, and space around separated objects.

Now, as every spot of sunlight or shadow produces individual units of tone in the subject, and the semi-opaque veil, drawn between the eye and the subject by the presence of fog, or mist, affects the relationship of tones in different parts, it is evident these effects are of quite as much importance in producing the composition as the shapes, and local tone values, of any solid objects entering therein.

By utilizing these passing effects, the worker can give individual interpretation to the material before the lens and secure balance, interesting pattern and increased perspective in the composition, which cannot often be obtained otherwise.



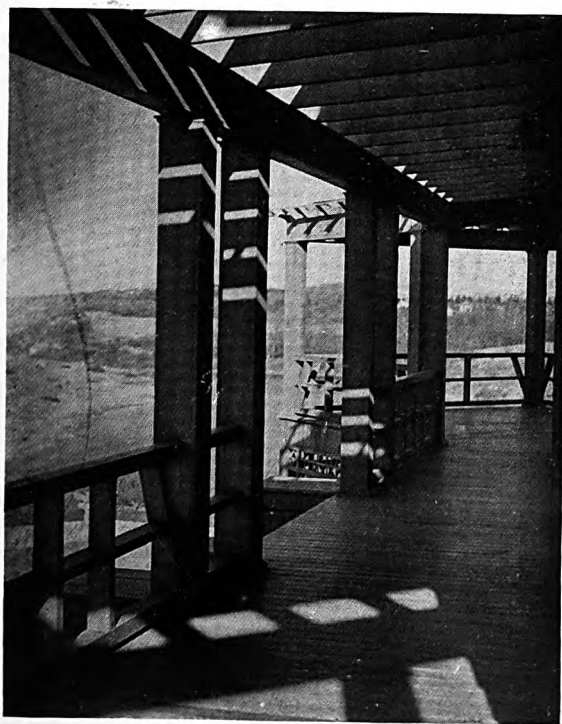
"A WET MORNING." WILLIAM S. DAVIS



TOWLES STUDIO, WASHINGTON, D. C.

The ideal conditions for making exposures—clear air and the sun high overhead—is the least favorable time for finding pictorial effects. Occasionally, it is true, an interesting play of shadow is cast under such conditions by projecting parts upon the side of a building or other vertical surface, but even then the softening of the sharp contrasts by a screen of haze in the air generally gives more pictorial quality to the subject. Outside of such exceptional cases, however, one will certainly be far more likely to discover pleasing proportions of light and shadow when a scene is lighted from a comparatively low angle; either from one side or back of the objects. A scene in which flat open spaces predominate needs a lower angle of lighting to produce the requisite area of shadow from such variations in the material as are capable of casting them. Indeed, it is frequently surprising how much shadow slight elevations, in a seemingly flat expanse of snow or open field, can cast when the sun is low enough to project nearly horizontal rays across the surface.

The direction in which shadows fall in the foreground—to the right or left, away from, or toward, the spectator, determine the shape of the light and dark spaces in the composition, their edges constituting lines which can be made to lead the eye over an otherwise flat-toned foreground right to the main feature—in other words, help focus the interest. Such effects are usually very helpful in scenes with flat foregrounds, such as open landscapes, beaches, etc.



"SUN-SPOTTED." WILLIAM S. DAVIS

We have indicated how low rays of light may be used to emphasize shadows upon a nearly flat expanse. In the same manner, a vertical surface of varied contour will have all its texture and detail brought out when the light falls from an angle in a lateral direction.

When suppression, rather than emphasis, of minute detail and texture in individual parts is required, observation will show that it is brought about when the light is much diffused or more directly upon the subject (either reducing the shadow effect); while the scene is enveloped in mist, and when the sun is far enough back of the parts so their shadowed sides are toward the observer. Which of these means to use depends wholly upon the tonal spacing desired; for, of course, there is a decided difference in the effects produced in each instance.

The presence of clouds over the sun, and of fog or mist, reduces the general contrast at each end of the tone scale, but not in the same degree; a cloudy sky, flattening the tonality mainly by lowering the brilliancy of the high-lights, while fog affects the shadows to a greater degree, the most noticeable effect being in those parts furthest from the eye. These atmospheric conditions alter greatly the relative tonality of the "planes" in an extensive prospect, this term being used to express collectively the various distances at which parts of the



"THE SHADOWED BACKGROUND." WILLIAM S. DAVIS

scene are located from the observer. An overcast sky, while flattening the contrast, does not, when the lower air is clear, reduce the depth of tone in distant parts much more, if any, than is the case on a bright day. On the other hand, mist or fog reduces the darker tones proportionately to the distance of objects from the eye, until they finally merge completely with the flat tone of the atmosphere. This effect provides the means for emphasizing the separation of one plane from another, and conveying an impression of their relative distance from the eye. Also, it gives one the opportunity to obliterate undesirable material, which cannot be bodily removed, and at the same time, concentrate the interest upon the nearer parts of the view.

No mention of nature's effects would be complete without at least passing reference to the countless varied forms of the clouds, the light and shadow among them, and passing shadows which they cast upon the open reaches of land and sea. They, and their cast shadows, furnish the tones for balancing other parts of the composition when nothing else can, besides frequently being sufficiently beautiful to use as the focal point of the picture.

Among other effects of pictorial value are those seen during or after a shower, when reflections are introduced by puddles or wet surfaces of pavements, and those occurring during a driving snow storm. Then come the effects found after nightfall, when the scene is illuminated by the moon or artificial light.

Surely, when one stops to consider the wonderful transformation in aspect, which even a single subject can undergo, there does not seem to be any excuse for lack of variety in one's work.

NATURAL COLOR PHOTOGRAPHY

POITEVIN made further advance in the lines of Niepce. He prepared ordinary photographic paper, first, by floating it upon a solution of sodium chloride, and then on solution of silver nitrate. After washing the excess of silver from the paper, it is dried and then immersed in a dilute solution of stannic chloride and bath and immersed paper exposed five minutes to diffused daylight, the paper then removed from the bath and well washed, to increase the sensitiveness of the subsalt of silver, which has resulted, and finally treated to a solution of potassium bichromate and cupric sulphate and dried in the dark.

Exposure is made under colored glass. Colored images result, which are fixed in sulphuric acid.

St. Florent, about 1874, reproduced spectrum colors by means of silver chloride. He immersed ordinary albumen paper in a solution of silver nitrate and afterwards plunges it into a solution of uranium nitrate and zinc chloride in alcohol acidulated with hydrochloric acid. This paper is exposed to light until it takes a violet-blue color or a lavender tint. After having been further sensitized in an acid solution of mercuric nitrate and dried on blotting paper, it is ready for the impressions.

Under the action of the light the mercuric chloride formed is reduced to

mercurous chloride, and chlorine is released, which transforms the sub-chloride of silver, formed during exposure into silver chloride, and, at the same time, takes up such a physical condition as makes it responsive to luminous colored rays.

Red seems preponderant, as this color persists in all the spectrum band, which is due to the extra action of infra red and ultra violet rays.

If collodion is used as a basis, instead of paper, a heliochrome is formed upon glass. The metal, in combination with the chlorine, seems to influence the quality of the silver chloride formed.

According to the nature of the chloride employed to precipitate the silver chloride, and according to the character of the colored glass used in copying, there is a difference in the results of coloration.

Robert Hunt had already noticed this phenomenon.

Bromide and iodide of silver behave in an analogous manner. On decomposition by light they show colorations which differ, according to the kind of iodide or bromide in the compound.

REGARDING THE SPECTRUM

IF a gelatine plate is exposed to the rays of light, it will absorb a part of these rays, but another part passes through it, the rest being reflected. Only such rays as are retained by the light sensitive film have a photographic action. But not all rays that are absorbed by the film produce the latent image which is evolved by development. A considerable number of the rays are changed to heat. The latter is generally the case with the luminous, the yellow and the red rays.

The gelatine plate, and still more, the collodion plate, prove, therefore, almost indifferent toward the luminous spectrum, at least in short exposures; and after prolonged insolation, one first discovers that these rays are capable of exercising a photographic effect as well, even if extremely weak. If the photographed spectrum of the solar light is compared with the absorption spectrum of the light sensitive substance of the plate, one will find, in accordance with the foregoing, that the principal action will take place upon that part of the plate where the light-band appears darkest in the subjective spectrum. If the absorbing film becomes thicker, the darkness will advance.

Like the light, sensitive modifications of the silver bromide, the granular and powdery, so the glassy mass will also absorb the same rays of light.

Heat is not without influence upon the light sensitiveness. According to observations of Schumann, a photographic plate will always lose a little in sensitiveness if dried at a high temperature, but it will work quicker and become more sensitive if the heating is proceeded with after drying, and the reduction of the silver bromide proceeds in the developer almost instantaneously through the whole film, if the temperature amounted to more than 100 degrees centigrade. The relation of silver bromide, therefore, differs toward the light and the developer, according to the temperature to which it was exposed.



SHAW STUDIO, BERKELEY, CALIF.



GERHARD SISTERS, ST. LOUIS, MO.

THE MECHANICS OF DEVELOPMENT

IT never ceases to be a marvelous thing to see the gradual growth of the negative image from the blank and formless surface of the exposed plate.

It is as much magic as any other inexplicable phenomenon of nature.

We might possibly get nearer a solution were we able to say what effect is produced by the impact of light upon the responsive silver molecules in the sensitive film. A good deal has been ventured by philosophers by way of explanation, but like Faust, despite all our investigation, we are "no wiser than we were before."

The question is very patly answered in the elementary books by saying: "the developer continues the action of the light," or again, by some scientific theorist—"light converts the bromide of silver into a salt of silver containing less bromide, and this sub-salt is further reduced to metallic silver by the agency of the developer." Now, here is a contradiction, and so it is impossible that both should be correct.

As to the first answer, we know that it is impossible to get as brilliant a picture (image) by prolonged exposure of a sensitive plate to light as we can get by a comparatively brief exposure of the plate and a development of it. It is, moreover, highly improbable that silver bromide in the shape it exists in a dry plate can be reduced by light to the metallic state.

The second theory which presupposes that the action of the light and the developer are individually distinct actions, is somewhat more in accord with fact, but a study of the other reactions of sub-bromides of silver shows that the whole process of evolution of the photographic image is not explained by what is advanced. The process by which a plate may be exposed to the action of light and then immersed in a solution of hyposulphite of soda before development, which subsequent development with nascent silver makes yield a brilliant, strong negative, capable of giving an excellent print, shows definitely the presence of some silver retained in the emulsion in those parts of the film exposed to the action of light.

Now, this we do know with comparative certainty that hypo decomposes the sub-bromide of silver into silver bromide and metallic silver.

Hypo is, therefore, able to accomplish half the work which the developer is credited with doing entirely. It does not look reasonable to think that a strongly developed negative contains only twice the amount of metallic silver as that from the hypo. The developer reduces only the silver bromide particles upon which the light has acted on the exposure of the plate is what everyone will admit, and does not affect the silver salt not presented to its action. But we know the fact that in an exposed plate silver bromide is reduced which has not been struck by light as well as that which has.

In the making of a silver bromide emulsion there is formed a congregation of molecules of the silver bromide, a grouping as it is called (ripening of the emulsion). A sensitive plate is, therefore, a sort of granular aggregation of silver bromide particles. During the exposure a commotion is set up by light

striking against them on one side only, the side towards the light. Now, it is highly probable that there are present in the group some molecules which are poorer in bromine—and in the middle, say, or in parts turned from light impulse, and, of a consequence, they remain unaffected (unaltered bromide of silver).

Molecules of bromide of silver and of sub-bromide are, therefore, in close association a peculiar chemical group, which acts like an individual molecule—by dissociation of its component particles—not like a mere mechanical congregation of identical molecules. That is, probably electric action takes place and new positions of equilibrium are established.

An alkaline developer may act in this way on the group of molecules in their oscillation, setting up a galvanic current, and where the groups of silver bromide are the most complex, the action of the continued development would be the more energetic.

A highly sensitive emulsion is coarser grained than a slow emulsion because there are more compound molecules in its make-up.

Physics will have to help us in our investigation of the phenomena of exposure and development as well as chemistry, since chemical action alone cannot do it.

THE INFLUENCE OF DILUTION OF DEVELOPER UPON THE CHARACTER OF THE IMAGE

TO derive the accredited advantages of the stand or tank method of development, that is, to give it a practical test, the operator should first of all set out to get data of the results effected by different degrees of dilution of the developing solution made use of.

The most expedient way to set about this is to test the effects produced by submitting portions of the same plate to exposure under identical conditions, developing the one part by application to normally constituted developer (ordinary formula), the other parts to developers of different degrees of dilution. Judgment of effect produced in the character of the image produced may thus be had on a rational basis and application made with confidence in practical manipulation.

Let us take, for instance, a gelatine plate of a known high sensitometric scale and divide it into three sections and expose each section to a standard light for the same interval of time.

Meanwhile, have ready in three different trays, developer of a fixed formula. In the first let the dilution be 1-30, and the second 1-150, and in the third 1-300. That is, we have in the first tray a normal developer, in the second five times dilution, in the third ten times the dilution.

Place the exposed plates respectively in the different trays and note the time it takes for the first appearance of the image.

Let us suppose that in No. 1 (normal), the image shows up in 40 seconds,

and gets fully developed in 4 minutes, that is, the detail is visible in the deepest shadows—where the impact of light was least.

In the second tray (1-150), we note it takes 4 minutes before the image appears at all and we have left the plate in the developer 24 minutes to get it to the density of No. 1.

In the third tray the image shows up only after 12 minutes and requires development for 84 minutes to make of the same quality as the others in shadow, detail, etc. You learn from this that the times of development are not proportional to the degrees of dilution of the developer, inasmuch as the five-fold dilution affords not five, but six-fold, and the tenth-fold dilution, not ten, but twenty-one-fold time.

Let us now examine the degrees of development by observation from the back of the plate (glass side). We perceive that with No. 1 in the strongest lighted parts of the image the development has gone to the limit, while with No. 2, the effect is less and in No. 3 least of all.

The conclusion reached is, therefore, this—that after fixation of the plate, the gradations and hence the whole character of the image resulting from the developments are materially different. There is a great variation of density apparent in the three examples.

In ordinary photographic parlance, we would say that increased dilution of the developer produces increase of thinness of image (weak negatives). And it follows, as a consequence, that tank or dilute developer is especially serviceable for under-exposed plates, liable to give with normal developer excessive contrast.

We get more harmonious negatives, more delicate and free from veil, with good tonal values, but, perhaps, of not sufficient printing density, but capable of being made so by intensification without hurt to the virtues secured by their mode of evolution.

Another good feature secured by dilution of the developer is clearness of the image and better structure of film (less granularity) than presented in plates normally developed.

It is good practice where plates of unknown exposures are submitted for development to place such, first of all, in a ten-fold diluted developer and watch how long a time it takes before the image begins to appear.

We have our data to go by for we know it takes, under normal exposure, just 12 minutes, so if we note that the doubtful exposure begins to give evidence that something is doing in 6 minutes, we conclude that the plate has been over-exposed and we can act accordingly to save it in time and reach for the bromide bottle; develop for density and, if needed, afterwards reduce. But if the plate under probate does not show up, after being in the (1-300) solution for over the 12 minutes, we predict under-exposure, and consign it at once to the tender mercies of this (1-300) till it slowly works out its own salvation and in a proper state to allow of strengthening for printing purpose. Sometimes a negative thus evolved may be effectually strengthened by placing it (before fixation, of course) in a strong developer for a minute or two.

PICTORIAL DISTANCE

THE landscape photographer who feels that he has made a pictorial transcript from nature naturally feels some disappointment after he hears the opinion of the painter critic that though the picture possesses merit for selection and management of composition, it does not present the distance in the proper terms of art. In other words, the painter means that the photographic landscape does not show the far off distance in the manner a good artist with brush and color would. He does not get the same atmospheric effect in his photograph which is the charm of the painting.

Now, this verdict naturally seems to the photo-artist unfair. He will retort, "Has not the unerring lens delineated the forms of things with greater accuracy than could the most skilled draughtsman?" Why condemn the photograph, then, for the faithful presentation of nature? Is it not the duty of the realistic artist to represent all objects upon the plane of the picture exactly as he sees them both as to form and color? "All well and truly said," retorts the painter, "the painted picture does produce the same effect upon the eye of the observer as the original scene did at the painting"—and just because the photograph does not do this, in that particular it falls short of being art. "Is this pronouncement of the painters not really a contradiction of terms?" says the photo-pictorialist. "Is it not a mere quibble in words?"

"No,"—replies the painter—"but the reproduction of what we see is something different from what the lens sees"—for the act of seeing is a very complicated process, based partly on sensual, partly on intellectual activity. The seeing of the lens—if we may so put it—is a purely physical process according to geometric principles.

It requires a decided effort on our part when looking at things with normal vision to separate these two activities from each other and to study each separately. Indeed, if the attempt is made to separate one's enjoyment of the art, part is at once dissipated.

The perfect accord of the two functions is really the faculty necessary to the artist. He must be able to produce upon the canvas the pure sensual impression as modified by what his mental activity interposes

All things which exercise influence upon the imagination of the artist are presented of a size in the picture considerably out of their actual proportions. Mountains in the distance are invariably represented much higher than they actually are in relation with others of the pictorial elements, and the same is true of all other distant objects.

When we stand before a painting of some mountain scene we notice that as a whole it is a faithful transcript of nature, even critically analyzed with a view to determine whether the relative parts are in geometric proportion or not, and yet we are, at the same time, thoroughly convinced that the mountains when visually isolated are much exaggerated.

We do not condemn the painter or charge him with fraudulent intent, because with his trained eye and skilled hand he has made the mountains the

salient feature of the view greater than possibly they can be in that region of the earth.

One thing you will note, however, the painted mountains are never shown with detail, but as if seen through a fine mist or light cloud, or as if transformed to clouds—and this dimness justifies the exaggeration, because it deceives the eye into the belief that because they are faint they must be a great way off, while the visual angle under which they actually are remains unchanged. This deception is warranty for the artist's exaggeration.

The chief reliance, therefore, of the landscape photographer for attainment of pictorial effect of retirement in the receding passages of the picture, must be sought for in the intervention of atmosphere, but we must confess that even here he has not the wide scope of the painter, for the atmosphere suitable for art may, at the same time, overact upon the film and obliterate the distance entirely. The photographer cannot, like the painter, change the aspect at his will by bringing in more here and clearing away there in the different planes of the picture; that is, sharpening the detail or depressing it.

Attention to other features of the landscape may sometimes help to get this apparent exaggeration of the distant mountains in the view.

We judge of the sizes of things by comparison of them with something else. Photography can do marvels in this way and deceive as well as the painter, or let us say, "sophisticate." Consideration of the character of the background may help considerably in the artistic deception.

As a general rule the inclusion of any large near object of familiar aspect, particularly in a subject which has mountains in the distance, tends by comparison to dwarf and belittle their impressiveness and dignity. The greatest care should, therefore, be taken to avoid in the foreground, not only things comparable with the mountains, but any arrangement of lines or light and shade which may tend to divert attention from the motive expressive in the mountains.

DISCREPANCY IN COLOR THEORY

IN determination of the color of things, there is much liability of deception, even to normal vision, and even with normal perception, there is evidence of individual differences in opinion.

The association of mere sense impressions with preconceived notions of real facts is a prolific source of error of judgment. The deception, in regard to full colors, vivid positive color, is greater than with neutral tints.

Very frequently, brilliancy of color is one more to the intense reflection of white light than to inherent quality of brightness.

Moreover, brightness is dependent upon the clearness of the medium through which the object is viewed. If the atmosphere be dense, the brilliancy is diminished.

We accustom ourselves, when forming a judgment, to take into account; unconsciously, all the circumstances interfering with the impression made by

the color, thinking that we see the object in its right hue, when not really so, and this is the cause of want of correspondence with the photograph tone of the reproduction, even though orthochromatic aids may have been called to service for correct monochrome rendition.

Not only is this so where objects are viewed in a strong outdoor illumination, but equally so with our observation of things indoors.

For instance, we think we see the hangings in a room, invariably of the same color, which has been selected to harmonize with the color scheme of the interior.

Whereas, if we just stop to think, this cannot possibly be so, for the supposed constant color must vary in tone, according to the degree of illumination of the room.

In the works of the earlier painters, as well as in the pictures by unskilled artists, we see this uniformity in the draperies. The high-lights are all of one tone, the shadows, invariably, black.

The inexperienced artist is apt to see the colors in a face much fuller and more vivid than they really are, and hence, the reason why the portrait by an amateur painter is "doll-like," even though his drawing is correct.

The subject of color cannot be dismissed in an article, but it is a topic of much interest to all, and at the present time is attracting the attention of the photographer, by reason of the various methods devised to reproduce, by photography, the colors of nature.

The interest has not abated, notwithstanding many do not look upon the problem as solved by any of the instituted processes.

The closest approach to natural color, undoubtedly, is that founded on the theory of three-color sensations, but it looks as if this theory has run itself to ground, and can go no further.

Theories are most valuable aids to investigation and often lead to discovery of new facts, but when they are estimated at a worth beyond mere scaffolding to the building, they are apt to be misleading and obstructive to the mind, obsessed with their super-valuation.

It is not necessary here to do more than mention the foundation of the three-color photography. It regards the red, green and violet of the spectrum as primaries, the rest of the colors, secondaries.

This distinction is based on the fact that, while orange, yellow, blue and indigo may be formed by proper blending, neither red, green or violet can be thus produced.

The endeavor was made to put this theory on a physiological basis. Because the retina has a peculiar anatomical structure, certain bodies, called the rods and cones, it was assumed that in vision this arrangement, in some way, takes account of the primaries and by reflex action gives rise to all the other colors.

No proof of such an action as is ascribed to this retinal structure has ever been given. Physiologists are still in the dark as to what function the rods and cones conserve.

Light is still considered a mode of motion, notwithstanding the jolt the undulatory theory received by influx of discovery corpuscles and ions, and we still hold that all sensations of color are produced by a multitude of little waves. The vibrations have been counted, the extreme violet being nearly twice as rapid as the extreme red. Our perception of color is limited to single octave, but physical experiment tells us that the spectrum is elongated at both ends, though invisible, but respondent to chemical influence.

Bearing this in mind, it would seem an anomalous thing if, while the spectrum colors are a regular series in gradation, passing imperceptibly into one another, that only three special colors should be acclaimed primary ones, and all the others secondary or derivative.

White light is said to be the combination of all the colors, yet white light can be had by mixing red and green. There are some strange things about color which still wait for rational explanation.

Mixtures of blue and green sensation give rise to intermediate colors, which might be naturally expected; namely, blue greens. Likewise, blue and red mixtures produce purples, which partake of the nature of each individual color, but the yellow produced by red and green does not partake of the nature of each component.

If the number of colors, appreciated by normal vision, be infinite, the number of colors in nature, which the eye does not separate, is again as infinite. Outside of the distinction between dilute colors and deep hue colors, the eye makes no distinction of kind between colors.

For instance, most people would say that the difference the blue and green-blue of the spectrum is the same kind of difference existing between spectrum red and pink, and such would not perceive that pink does not belong to the spectrum colors at all.

While, theoretically, green is said to be compounded of blue and yellow, in practice it is found that a blending of blue and yellow lights produces white light, not green light. But green is called a primary, and red and violet are also classed as primaries. In pigments, blue and yellow make green, but in light mixtures, this does not follow.

What is the relationship of white to green? Indeed, some physicists supposed that white is really a color of the spectrum, with its place immediately below the green band, differing from green by a shade only.

In the case of purple and green, which yields white or mixture, the purple is not on the spectrum at all.

How does the three primary color theory explain this?



COLOR SENSITIVE PLATES— THEIR USE AND ABUSE

REGARDING color sensitiveness alone, the photographer has choice of three kinds of orthochromatic plates, those sensitive to yellow and green, those sensitive to red and yellow and the panchromatic, sensitive to red, yellow and green—so that for the photography of pigmented and dyed bodies, he is in good position to fairly well reproduce colored things in relative tone in monochrome—nevertheless, the properties of these plates are not generally appreciated by those who expect directly perfect orthochromatism.

The method of using these plates is not generally understood, because despite the extra sensitiveness over the ordinary plate, they are still like it, over-sensitive *per se* to the blue and violet and this practically makes them alone scarcely better than the ordinary plate, the reproduction of the values being just as false when blue and violet are included with the other colors.

A perfect orthochromatic plate ought to give the same intensity in the reproduction as the visual density. The only way to approximate this correspondence, and it is possible at times to approach it very closely, is by use of screens in conjunction with the special plate. We should match a color screen to a specially sensitized plate so as to get the nearest we can to perfect orthochromatism.

The screen selected must be suitable for the light as well as the plate, because an absorbent of blue rays, which might be perfectly satisfactory where a great deal of it is present, might produce too great an effect upon a light containing less blue.

Many objects of different colors reflect so much white light mixed with the initial color that color proper intensity hardly needs correction, so that in many cases, it is possible to secure the correction by use of a screen of a character which need not cut off so much light to unnecessarily demand prolonged exposure. It is even possible to get better rendition of certain colors, which most need correction, by disregard of the peculiar action of colors and consider merely the light scale. It is the encountering of such subjects by the photographer, who will tell the advocate of orthochromatic plates, that as good color rendition may be had with an ordinary plate with a little longer exposure and manipulation in development. No one denies it, because the character of the subject and the intensity of illumination, must always be taken into consideration. It is not always possible in practice to get satisfaction even when we properly adjust color screen to color plate.

Indeed, color screens are not always to be used in orthochromatic work.

They diminish the intensity of the light of the particular color that the plate is over sensitive to. So it follows that if this over energetic light does not specially influence the plate, there is little or no use for the screen.

This is particularly the case where the illumination is somewhat deficient in violet light, ordinary gas light or lamp light. The deficiency of the intensity of

such a light enables one to give the values of color much as they visually appear by daylight illumination, because here the oversensitiveness of the plate to violet light may have its effect without overimpression of its action. But where oversensitiveness of the plate to blue and violet is not compensated for by a deficiency in action of these colors by the character of the light under which they are visible—then a color screen is absolutely needed and unless the proper kind of screen is chosen in conjunction with the right kind of plate you may not only not get as good results as with the use of an ordinary plate with a screen, but you may completely reverse the visual values.

It is the half knowledge about orthochromatic photography which leads many to undervalue the great advantage it presents and to make ridiculous assertions about it.

You must study how to get on the orthochromatic plate the visual values of the original.

THE FIXATION OF GASLIGHT PRINTS

AN amateur photographer once asked a professional how it was that orders took ten days to complete when he (the amateur) could take a photograph and finish it the same day. The professional replied that the making of a thousand finished photographs was not quite the same thing as the making of a single quarter-plate print.

He was right in more ways than one, for photography in quantity involves many things over and above multiplication, and in no case is this truer than in the case of gaslight prints. The exposure that makes one perfect print may not make a dozen if switched on twelve times, because currents often fluctuate and emulsions get mixed, and gaslights have not sufficient latitude to cover these changes. The developer that gives the desired result on an experimental print may fail to turn out a quantity as good. But it is fixation I want to talk about now.

Almost any fixing bath will fix a single gaslight print or a small number of prints, but the fixation of large batches that must be washed automatically and dried automatically and finished to time is something of a problem. In the first place, if the system does not include a stop bath the fixer must be acid, to prevent the risk of staining and continued development, when the bath is not quite new. Then to permit of rapid or hot drying (which is very essential when dealing with thousands per day) a hardening agent is required. This, of course, might be applied as a separate bath, but to simplify matters and save time it is usual to incorporate it with the fixer, and thus we get the numerous well known acid-hardening-fixing baths. Now, while the acid may assist the fixing proper, by killing the developer, the hardener hinders it by closing up the pores of the gelatine and making it comparatively difficult for the hypo to do its work. It is also natural to suppose that the washing water is hampered in the same way, and so we come to believe that plain hypo is advisable if permanence is desired. But the trade production of gaslight prints demands both acid and hardener

together, and the only alternative would be to employ them as separate baths, washing after fixing and before hardening, and then washing again. And this would mean extra time and extra labor. I have tried all the acid-fixing baths, but without finding one that was absolutely satisfactory until I evolved one from two old formulæ, and up to now, after extensive use, I am of the opinion that my mixture is a good one. I give it below for anyone who cares to try it. It is a little troublesome to make up, but can be used for plates, films, and bromide papers, besides gaslights, and it has been found very good for the former in hot weather. The formula is:

	A	Avoirdupois
Hypo		1 lb.
Water		60 oz.
B		
Water (hot)		15 oz.
White alum		$\frac{1}{2}$ oz.
Chrome alum		$\frac{1}{4}$ oz.
Sodium sulphite		1 oz.
Glacial acetic acid		$\frac{1}{2}$ oz.

In compounding (b), first completely dissolve the white alum in the water, and then add the chrome alum. When this is dissolved add the sulphite, and when the mixture has cooled down put in the acid, then wait for all cloudiness to disappear before adding (b) to (a). I should add that the formula was originally devised for prints that had been through a stop bath; for use with prints coming straight from the developer it is advisable to use an extra $\frac{1}{2}$ oz. of the acetic acid.

The fixation of large batches, to be thorough, must be attended with great care. In some workshops it is the practice for prints to be fixed by the worker who develops, and if the prints are in small quantities there is no reason why anything should go wrong. I do not believe it possible, however, for a very busy developing operator to divide his or her attention between two dishes without something suffering. An alternative is to have a special assistant for fixing, and if the work is fixed immediately after development this means one fixer to each developer, or at the least one to every two. A compromise can be brought about by the use of acid stop baths, into which the prints can be dropped to await periodical collection for mass fixation. This method has the advantage of giving special attention to fixing without undue increases in staff, one hand being able to deal satisfactorily with anything up to 6,000 per day. It will be understood, of course, that this means a skilled hand who knows what fixing is, and not a new apprentice.

The composition and strength of a stop bath for quantities of gaslight prints is a matter of some importance. The first time I tried the method I used a 1 in 80 solution of glacial acetic acid, and found it all right at the time. This was with amidol, slightly restrained with bromide, as the developer. Being left unexpectedly without amidol through a consignment failing to arrive, I tried

M.-Q. for a time, and found the stop bath still worked. Preferring amidol, I tried another make, and then things began to happen. Prints stained by the dozen, the stains being of that yellowy pink so common to gaslight papers when forced or developed without restrainer. I tried longer exposures, but found that the stop bath then failed to stop, the prints continuing to darken until removed to fix. An increase of bromide reduced the trouble, but spoilt the color of the work. A reduction in the amount of bromide, coupled with an addition of metabisulphite, had a beneficial effect, but was not an absolute cure. A peculiarity of these stains was the fact that some did not appear until the print was fixed or even washed. Suspecting that the acid was not capable of neutralizing the developer, I soaked unused paper in developer, then in the acid, and dried it without washing. It was stained. I then tried a piece of clean writing paper the same way, with the same result, so I decided against the acetic, and began to use sulphuric. Similar tests with sulphuric showed much cleaner results, and as a stop bath it had the advantage of cheapness, besides efficiency, a strength of 1 in 60 being active. But after using a little while the sulphuric bath throws off sulphur dioxide from the sulphite on the prints, and though this is an excellent germicide it is not every photographic hand that can put up with it. In the case I am referring to, the acid had another objection. Occasionally prints would appear in a semi-toned state; they seemed to acquire the colored patches in the wash, but the only feasible solution of the occurrence was that traces of sulphuric acid had been carried in the film to the fixing bath, where the action of hypo on it had deposited sulphur in the gelatine, and this caused the toning before it was washed out. To have used sulphurous instead of sulphuric acid would have obviated this possibility, but would have been as bad with regard to fumes. Metabisulphite might have solved the problem, but I could not obtain a supply of standard quality. I eventually resorted again to acetic acid, and tried using it stronger, and this, in combination with an acid amidol developer, worked fairly well, though I am convinced that acetic acid as a stop bath is not ideal, and I hope to find a substitute that will be efficient without being obnoxious or expensive.

With bromide and slow development papers the same demands are not made on the stop bath, and as far as my experience and information go, a weak solution of acetic acid is quite suitable.

There is one hint I think may be useful to devotees of the stop bath system. Some workers have doubts as to when the bath is exhausted. It can be tested easily by means of litmus papers, and these can be bought in little books from any wholesale chemist. Blue papers should be specified. To test the bath, tear off one of the leaves, and soak one end of it for a second in the developer, then transfer it to the bath for five or six seconds. Inspect it by daylight, when, if the bath is fully active, the wet part of the leaf will be brilliant red. If the color is doubtful or is a mixture of red and blue patches the bath is getting exhausted, and should be thrown away. A leaf dipped direct into the acid bath will redden after the bath has lost strength, and so is not a fair test.—THERMIT in *The British Journal of Photography*.

THE AESTHETIC'S DEBT—J. B.

IT makes one "mad," sometimes, to note the sneering smile with which the æsthetic photographer will treat any suggestions as to the worth, importance or even need of technical consideration in photographic work; but does the artistic photographer, who sees nothing but æsthetics in photography, ever stop a moment to consider this snuffer to his arrogance, that the high phase which the art has attained is due solely and singly to the more perfect methods of reproduction we now enjoy over the workers a half century ago? Or that these mechanico-chemical means of expression, which translate so effectively his high aspirations, are due entirely to the laboratory worker?

We are not deprecating photographic art; rather do we seek to hold up the hands of those who are exalting its prerogatives—but we would make a plea for more interest on the part of the profession for the, at least, equally important technical phase.

Photography is most essentially a scientific art, and even those who have only room for expression of artistic aspiration will fall afoul of their high goal if they neglect the means by which photography as an art alone can advance.

It is deplorable to note the almost universal disregard of the average professional for the chemistry of photography—and yet we get letter after letter, inquiring for explanation of the failure in the working of some recommended formula not couched in words of one syllable. They protest that they have literally followed directions, and we have to patiently hear inuendoes, not loud, but deep, about careless editors' faulty proofs and the uselessness of photographic journals. Yet the very questions they desire elucidated, display their woeful ignorance of even the fundamental principles of the science.

The photographer who has a reasonable—not necessarily profound—acquaintance with what relates to his profession is able to surmount impediments. He at once perceives what is wrong (if the editor has been nodding), and is able intelligently to modify or adapt to varying conditions.

Every earnest worker is aware that the conditions under which our work is done are liable to a considerable degree of variation, and when the unexpected equation presents itself they are able either to resolve it or to determine its impracticability.

One may have plain and pleasant sailing and a wholly prosperous voyage while things flow gently and no adverse winds present, and repose in the cabin of complacency, feeling secure as to results—indifferent to the further necessity of anything beyond a rule-of-thumb method for pushing forward; but a time may come, some day, doubtless has come to some of us, when conditions in the craft are not so uniform, and when the stereotyped, mechanical means are not adequate, when we are up against adverse factors, stubborn or even impossible to cope with, because of our ignorance of the first principles of the science. Then we are the mere slaves of circumstance; then we begin to appreciate that the unexpected conditions have mastered us for want of knowledge to control them.

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Density of Negative

THE terms used in photographic parlance, though often open to the charge of ambiguity and attendant with some confusion of ideas, have received such sanction from general acceptance of their specific application, that it would be unwise to adjust them so as to restore each to its proper function, as indicative of its meaning, and, in the particular case here considered, it may be just as well to let the term "density," as applied to a particular stage of development of the exposed plate, go without protest; but to avoid confusion, it may be advantageous to remind that "density" is liable to be confounded with what is really "opacity" to the transmission of light, and so something quite different from the phenomenon the photographer elects to call "density." But the distinction between the two must always be kept in mind, viz., "deposit density" and "light density." A certain area of the negative may, therefore, be opaque without necessarily being dense from a deposit of silver upon a particular part.

It is a current belief among practitioners that it is possible to alter the scale of gradation in a negative by variation in the method employed to develop the latent image, and so, in this way, compensate for error of exposure. This belief of the practical worker is not to be summarily dismissed as fallacious, inasmuch as it is the outcome of experience, but it would seem, from the research of the photo-physicists, that the ratio of densities of deposits corresponding to different intensities of light action are determined by the amount of light and the character of the sensitive film,

and accordingly are not so dependent upon character of development; but it is well to keep in mind that it is density of deposit, not opacity to transmission of light.

The practical man naturally regards more the ratio of opacity of the different areas.

Although it is not possible to alter ratios of density proper, nevertheless, we can alter the absorptive values by stopping development at different stages, and, in this way, alter the opacity ratios, thereby altering the printing quality of the negative. Photographers, in negative practice, encounter two varieties of fog, the "chemical fog" and the "light fog."

The nature of chemical fog, incident upon development, has not been sufficiently studied. It is generally understood to mean a deposit of silver formed all over the film during development, and hence something different from the fog caused by light, independent of it.

For instance, when the photographer modifies the method of development, in under-exposure, by increasing the content of alkali, the tendency to general fog is imminent. Reduction of the proportion of reagent has the same tendency, because it necessitates prolongation of the time to which the film is subjected in the developer. On the contrary, when bromide of potassium is added to the developer for modifying action from over-exposure, and content of alkali reduced, the danger to fog is lessened.

Development for density of deposit is continued until indications present that the limit is attained, thus increasing the absolute values of density, as well as the ratios of opacity.

It is general good advice to advocate erring on the side of insufficient density, because better results may subsequently be had by intensification. The half-tones suffer inordinately when reduction of image is effected upon an over-dense negative.

Solution

The phenomenon of solution of a solid body in a liquid is familiar enough, but how few ever give thought to inquire how it is brought about. What really happens to the solid form, often very hard substance, when it quickly disappears in solution?

Take a crystal of potassium iodide, for instance, a hard, brittle body, and with what avidity it starts to work when dropped in a glass of water?

Chemists have asked themselves the question, but no very convincing answer was vouchsafed until quite recently and this was only possible because of the light had from new discoveries in the action of things.

Chemists have come to the conclusion that, despite all our experience, comparatively little is known about matter in its solid state. We know that it takes different forms; that is, it is shapeless or amorphous and again presented in regular beautiful crystalline shapes almost like an organic body. We can tell, too, how solids conduct the different forms of energy—and know something about other physical properties. But we are at loss why some things should present crystalline form in preference to amorphous conditions.

We are only able to tell you a little more about solids when we change them to the liquid form.

Then we tell you pretty accurately the molecular weight, but we are limited even here, it is only when we get the solids into the third form of matter, the gaseous, that we can speak with more assurance, because here we can call to aid mathematics.

Some little advance has been made in the direction of the relation between solutions and gases.

Little as our information may be, it is looked upon as the most important step towards a comprehension of the phenomena of solution.

One theory, in brief, holds that the minute particles of a solid in solution obey the laws prevailing with gases.

In dilute solutions the conditions approximate the conditions in gaseous state, but in concentrated solutions there is shown deviations similar to those shown by gases under great pressure, when near the point of passing into the liquid form.

Yet, if we take into consideration the fact that solids have the power of dissolving one another under certain conditions, then a solution may be a solid so the definition given above would be inadequate.

Arrhenius explains solution by saying that substances in aqueous solution are dissociated more or less into ions, but this would hold only for very dilute solution. It does not explain the degree of saturation.

What is generally accepted at present is stated thus: We have to take a concrete example to make it clear. We take, for instance, the compound of a chloride or

bromide. We are told that this is formed by a union of a molecule of the chloride or bromide with a large number of the molecules of the water and it acts as a unit in lowering the freezing point of the remaining water, but the total amount of the water, which is now acting as a solvent, is diminished by the amount taken up by the molecules of the bromide or chloride.

It might be asked whether a double salt, say alum, exists in solution as a double salt, or whether it breaks up into simpler salts, which dissociate in the usual way?

Chemistry is fundamentally the science of solutions, since we really study matter only in this way.

The Pronunciation and Spelling of Chemical Terms

To the Editor of the PHOTOGRAPHIC JOURNAL OF AMERICA:

The current (March) number of your journal contains an article on the pronunciation and spelling of ordinary chemical terms, which I think will bear some criticism. An effort has been made in the United States to drop useless letters, which are so frequent in English words. This has met with bitter opposition by many, especially in England. Concerning common chemical terms, the useless final "e" has been dropped in a number of cases.

If I correctly understand the author of the article under consideration, it is desired to employ a pronunciation of such words as "bromide," "chlorine," "morphine" with a long "i" in the final syllable, so that "bromide" will rhyme with "hide," and "chlorine" with "pine." The accepted dictionaries, however, give preference to a short "i" sound in these words, and, in addition, throw the accent on the first syllable. "Bromide" is to be pronounced as if written "bromid," the accent being on "bro." It is the characteristic of English accent that it is rather concentrated, that is, the accented syllable dominates the word, the unaccented syllables being slurred, except in very long words when a secondary accent is introduced. In the English word "society," as commonly spoken, little is heard but the second syllable. The contrast with the French word "société," in which practically every syllable is heard, is quite marked.

Such pronunciations as "chlorine," "morphine," in which the last syllable rhymes with "pine," are not euphonious, but tend to take the accent away from the first syl-

lable. Inasmuch as we say, according to general rule, "bromid," "chlorin," "morphin," it seems best to spell that way. The claim often made that simplified spelling will deprive us of the etymologic relations is without value. The British people are opposed to the simplification of spelling, but then they are also opposed to the metric system, decimal currency, and some of the spelling reforms that Americans have universally adopted.

HENRY LEFFMANN.

The Photographic Mordant Dye Process for Negative Intensification

By F. E. IVES, F. R. P. S., F. R. M. S.

In a previous communication I pointed out that a diluted bleaching bath without sufficient action to visibly bleach the silver image would prepare it for taking up a large amount of basic dye from solution. This is the procedure recommended for "toning" silver images. It is obvious that if the dye used is of a non-actinic color, it will act as an intensifier, and the process can be employed in negative making for that purpose, giving a greater range of densities and more control of density probably than any other method.

For general use in intensifying, I recommend a mixture of victoria green and saffranin dyes, which in suitable proportions produce a near-black color by which the degree of photographic density can be closely estimated by the eye. Different makes of dyes vary somewhat, but I am using

Water	30 ounces
Victoria green	2½ grains
Saffranin	5 grains
Glacial acetic acid	¼ ounce

The process is very cheap, and the solutions keep indefinitely, but the time which it takes to dye up and subsequently clear the image, particularly on thickly coated plates and non-curling film, makes it unsuitable for "hurry" work.

For some special purposes, however, it is superior to any other method of negative intensification. Thus, by a single (complete) bleaching operation and a single dyeing, more printing density can be imparted to dry plate line or half-tone process negatives than by any other means. It adds much to the value of the method for that purpose that the dye print can be cleared and reduced as readily as an ordinary nega-

tive can be by Farmer's solution. The mordanting substance, silver ferricyanide, is extremely soluble in hypo, and a solution as weak as one grain to the ounce acts upon the dye image like Farmer's reducer upon an ordinary negative. Knowledge of this fact also shows the importance of washing out all hypo from the film before immersing in the bleaching bath, and avoiding any trace of hypo in the subsequent handling, except as indicated. The presence of chlorides and bromides is also contra-indicated.

Sulphite and Meta-bisulphite

The inquiry is frequently made as to which salt is preferable, sodium sulphite or sodium meta-bisulphite, in constitution of the developer.

Ordinary commercial sulphite of soda, which is the name sodium sulphite goes under in trade, has the formula $\text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O}$, which shows that it has just half its own weight of water, and this is the reason why the anhydrous salt (dry), when indicated in a developer formula, is given at only one-half the amount of the crystalline salt.

Crystalline sodium sulphite keeps pretty well if stoppered up, but if exposed to the air two changes take place. First, it effervesces, that is, gives up some of the water of the crystals, and we have the surface covered over with a white dust, which is a lower hydrate of the salt. This change does not, however, interfere with its usefulness.

But continued exposure further affects it and the oxygen of the air converts a part of it to the sulphate (note "sulphate"), which is a serious change as far as the integrity of sodium sulphite is concerned in its influence on the developer. Sulphate not only does not act as a preservative, but really retards its action. The action of the air is more energetic when the sulphite is in solution than when solid, and so you see that if you make up a stock solution of it you must not only keep it well corked, but must use boiled water from which the air is expelled in making up the sulphite stock solution.

Another thing to bear in mind is that it is necessary to have pure sulphite, at least photographically pure. You may be assured by the dealer that the sample he offers is pure and he is honest, although it may contain as much as 3 per cent. of carbonate of soda, because he reasons that

for the ordinary purposes to which sulphite is applied the carbonate is not injurious, but he is not perhaps a photographer or he would know that gold in the sulphite would be objectionable. It is advisable to get the sulphite from a special maker of photographic chemicals.

It is not necessary at this date in photographic practice to dilute on the advantages of sulphite in the developer.

We all use it and know its intrinsic value, though we remember not a few kicked against its introduction thirty years ago, even when a stain-inclined developer pyro was universal in practice. Now to the question as to the employment of sodium sulphite or the meta-bisulphite. We give our verdict for meta-bisulphite. This salt has the formula $\text{Na}_2\text{S}_2\text{O}_5$ ($\text{Na}_2\text{SO}_3\text{SO}_2$). In solution it decomposes probably into $\text{Na}_2\text{S}_2\text{O}_8$, that is, with an excess of acid, for it decidedly smells of it (sulphurous dioxid).

Meta-bisulphite, weight for weight, is stronger than sulphite.

With hydroquinone and pyro these agents are essential and their action is not otherwise than as a clearing agency, but with some of the modern developing agents it seems to have the power also of effecting density.

The Middle Atlantic States Convention IMPORTANT—R. R. RATES TO THE "BABY NATIONAL" CON- VENTION, BALTIMORE, MD., APRIL 18TH-21ST

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Of course you are coming—every live photographer in our district will be disappointed if you don't—and you most of all.

Just sit down, look yourself in the face and say, "Bill Jones or Sallie Smith, as the case may be—you're going to the "BABY National." Say it until you mean it.

Fraternally yours,

L. L. HIGGASON,
Secretary.

Fred Judge's Bromoil Transfers

At The Camera Club, New York, from February 1 to March 15, 1921, an exhibition was given of bromoil transfers by Fred Judge, F. R. P. S., of Hastings, England. His exhibit comprised eighty examples, some in colors; and they attracted great attention, not only because of their unusual excellence, but the fact that this process is not employed to any great extent in the United States.

Mr. Judge's technique is wonderful. It would be difficult to improve it. His work has a *finnesse* only imparted by the touch of a master hand. While his examples include the usual and requisite art features and beauty of tone, refraction, atmosphere, values and breadth of mass, one is made to feel the strength of delicacy and refinement in a degree not equally manifested by other processes and by but few other workers in photography. There is a restful charm and a richness of texture and subtlety in bromoil transfer that lend themselves to landscape and also were evidenced in Mr. Judge's marines and architectural subjects. There is great opportunity for control.

This one-man show followed well those of Mr. Bertram Cox and Mr. Alexander Keighley, the former in bromoil and the latter in carbon, and illustrated at The

Camera Club, and through it to the public, some of the different ways in which Nature can be interpreted by means of photography. Other processes will follow in due course and be exemplified by the foremost workers in this country and abroad. While Mr. Keighley's prints were very large in size and Mr. Cox's medium, Mr. Judge's were all small—4 x 5 to 6 x 8 and taught that art could be shown in any size.

On March 10th, the Salmagundi Club, which includes in its membership the greatest artists in America, attended the exhibition of Mr. Judge's pictures and were profuse in their praise and admiration. The Camera Club entertained about one hundred and fifty of these artists by a lantern slide display, the work of its members, including Dwight W. Elmendorf and Burton Holmes.—FLOYD VAIL, F. R. P. S.

Lectures at Brooklyn Institute of Arts and Sciences

At the Brooklyn Institute of Arts and Sciences, on February 24, 1921, Mr. Charles Henry Davis delivered an illustrated lecture on figure composition and portraiture. On February 28, 1921, Mr. Floyd Vail, F. R. P. S., discussed art as applied to winter scenes and marines, and criticised an exhibition of member's prints.

Among those present were J. H. McKinley, President of The Camera Club, New York; Mr. Clarence H. White, Mr. John Paul Edwards, of California; William E. MacNaughton, William A. Alcock, Richard M. Coit, Miss Sophie L. Lauffer and many other celebrities in the photographic world.

Photograph Finger Prints Without Camera

An important contribution to the standard methods employed in securing finger prints for purposes of identifying criminals is described with illustrations in the February *Popular Mechanics Magazine*. It has been made by one of the country's oldest and best-known experts in this line, and is a method of making negatives of finger prints found on transparent objects, without the use of a camera.

The new method consists in dusting the finger prints found on transparent objects such as bottles, paper weights, window glass, table glassware, bookcase doors, etc., with aluminum dust, which brings out sharply all the details of the curving lines in the skin which make a print a sure

means of identification. The next step is to lay a film over the prints after putting the object in a dark place. To make the exposure, a lighted match is held for an instant in such a position that its rays will shine through the transparent object onto the film, where a perfect negative is secured.

Not only does this improvement in copying finger prints eliminate all measurements and camera adjustments necessary in getting camera-made negatives the exact size of the original, but in many cases only by the new method can a full record of the prints of all fingers and thumb be secured on the same negative and at the same time. Thus a bottle, which a criminal has grasped in committing his crime, will leave prints extending two-thirds around the bottle, and to photograph them with a camera necessitates making several negatives.

Frank Jay Haynes

Frank Jay Haynes, first official Yellowstone Park photographer, died recently at his home in St. Paul, Minn. He was 68 years old. Mr. Haynes completed his 40th consecutive season in Yellowstone National Park last year. Surviving Mr. Haynes are his widow, daughter, two sons, G. O. Haynes and J. E. Haynes, who succeeded his father as official photographer in 1916.

Oscar G. Mason

Oscar G. Mason, for fifty years a professional medical and surgical photographer in Bellevue Hospital, New York City, and until recently photographer of the unidentified dead in the Morgue, died March 16th in the hospital of lobar pneumonia. He was 91 years old and lived at 211 West 80th Street.

Mr. Mason became connected with Bellevue Hospital as a photographer in 1856. When X-ray photography was introduced in 1897 he was made the hospital radiographer. In 1906 he resigned. Up to the time the Bureau of Unidentified Dead was established at Police Headquarters, Mr. Mason took photographs of the unclaimed dead. He also maintained an office at 333 East 26th Street and specialized in telescopic photography, taking astronomical pictures.

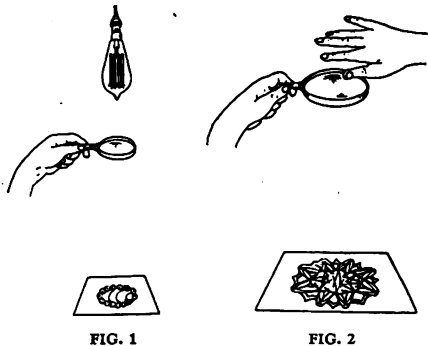
Mr. Mason was admitted to the hospital suffering from hardening of the arteries. He is survived by a widow and a daughter.

Lens Aberrations Used in Designing

It is well known that a simple uncorrected lens is subject to a number of optical defects, the most evident being chromatic aberration, whereby objects tend to be shown with a fringe of color. Few, however, are acquainted with the fact that these faults are capable, in certain circumstances, of producing very beautiful patterns and designs.

This can be demonstrated with an ordinary reading glass, a metal-filament electric bulb and a sheet of white cardboard. The writer used a bi-convex glass of 6 inches focus and $2\frac{3}{4}$ inches diameter, in conjunction with a 60-watt Osram or Mazda lamp of the usual pear shape. The bulb should be brought within a short distance of the table by means of an adapter and flexible wire connection. With a lens of the focus stated, about 26 inches from the bottom of the bulb to the table will be found most suitable.

On holding the reading glass in an horizontal position, about 5 inches from the bulb, with the white card directly underneath, as shown in Fig. 1, an exquisite feathery design, with a dark center and blue spots, edged with tints of orange and



red and shaded with delicate pearly greys, will be seen. This, of course, is a greatly aberrated and out-of-focus picture of the numerous incandescent filaments, viewed end-on.

On tilting the lens away from the horizontal, moving it out of the center, or varying its distance from the lamp, many different patterns will result. Fig. 2 is an attempt, with some artistic license, at recording one of these, though the drawing necessarily conveys little idea of the filmy softness and brilliant coloring of the original.

At a certain distance of the lens the design resembles a sunflower, at another a dahlia is suggested. In some positions the minute veining and gauzy shimmer of a butterfly's wing will be indicated, or prismatic feathers worthy of a humming bird. Obliquely used, the lens will produce strange, weird shapes, which, if photographed, might readily pass for spirit pictures in psychical circles.

If the fingers of one hand are spread open and held above the lens, between the latter and the lamp, as seen in Fig. 3, the pattern increases in complexity and becomes of a more star-shaped character. On moving the fingers to and fro across the lens the design will change and coruscate, something after the style of the old lantern



FIG. 3

chromotrope. A few narrow strips of cardboard laid across the lens like bars may also be used to vary the device.

For a more leisurely inspection of the patterns, it would be easy to make some kind of stand to support the lens, with provision for adjusting it at any desired distance or angle.

The designs possess a blended softness which, though an added beauty in itself, renders them difficult to copy by hand, but the artist or draughtsman should be able to gather many hints of dainty outline and subtle coloration by studying them attentively. If the lamp were mounted horizontally and the reading glass vertically, so that the image could be thrown on an upright screen of finely ground glass placed a suitable distance in front of the camera,

it should be possible to obtain color photographs of the patterns by working from the back.

The result is much improved by affixing an opaque disc of card or paper, about 2 inches in diameter, over the center of the lens, which reduces the spherical but increases zonal aberration, and also heightens the color effect. It may be pointed out that the late Professor Silvanus P. Thompson treated the subject of zonal aberration exhaustively in the Traill Taylor Memorial Lecture for 1902 (see "B. J. A.," 1903), but he naturally dealt with a point source of light (an arc lamp), which, though giving many interesting and curious figures, does not lend itself to decorative designs like a multi-filament bulb.—A. Lockett in *The British Journal of Photography*.

Development of Autochromes

In spite of the many methods for color-photography that have been devised, the autochrome constitutes the simplest and most satisfactory in many lines, especially in photomicrography. The development of the plate was at first a tedious and troublesome process, and all the more unsatisfactory because of the tenderness of the film, which caused the loss of many a picture. Two features of the development were somewhat irritating; the prescription of a special chemical, "metoquinone," sometimes called "quinomet," and the use of an acid permanganate as an oxidizing agent. The latter is liable to form flocculent manganese dioxide, which deposits on the plate. The writer had a very pretty plate injured in this way. A solution of potassium dichromate and sulphuric acid is much better for oxidizing purposes. It can be prepared very strong, and diluted when used. It keeps indefinitely, and is cheaper than the permanganate solution. The special developer, which figured in all the Lumière formula, was suspected by most photographers to be merely a mixture of our familiar dark-room twins, metol and hydroquinone, and this is now known to be the case.

Lumière Bros. have stated that instead of their "metoquinone," a mixture of metol and hydroquinone in the proportion of 10.5 parts of the former to 4.5 parts of the latter can be used. Victor Crémier states in *Photo-Revue* that the proportion of 7 parts of metol and 8 parts of hydroquinone gives excellent results. This is preferable, as metol is so much more costly

than the other substance. Adopting Crémier's modification of a formula, given by Lumière Bros., the following is a formula taken from a recent issue of the *Photographische Chronik*:

Water	1000 c.c. (1 qt.)
Metol	7 gm. (110 gr.)
Hydroquinone ..	8 gm. (130 gr.)
Sod. sul. (dry)	100 gm. (3½ oz. av.)
Am. (sp.gr. 0.923)	32 c.c. (1 fl. oz.)
Potassium Bro...	6 gm. (90 gr.)

For use, dilute with four volumes of water.

The following developer was proposed about the time that the autochrome came into use:

Water	1000 c.c. (1 qt.)
Sodium sulphite,	
dry	49 gm. (1½ oz. av.)
Metol	6.5 gm. (100 gr.)
Hydroquinone..	2 gm. (31 gr.)
Hypo	0.1 gm. (1.5 gr.)
Ammonia (sp.	
gr. 0.880) ..	20 c.c. (6 fl. dr.)
Potassium bro-	
midide	2.5 gm. (35 gr.)

For use, dilute with an equal volume of water.

For some lines of work, especially photomicrography, the second development may be omitted. Giving a good exposure and a good first development, the oxidizing agent is then applied until the silver deposit is completely removed. The plate is then washed and dried. The unchanged silver bromide will act as the opaque coating, upon which the correct color effect depends.

Striking effects can be obtained by the use of autochromes in photographing the colors produced by the transmission of polarized light through rock sections.—H.L.

Recent Researches in the Preparation of Emulsions

In a recent issue of *Photographische Rundschau*, Dr. Paul Knoche discusses this subject, saying that for some years no marked progress has been made in the field. Some patents have been taken out, but have not found practical application. Many experiments made by Knoche have indicated that gelatin is the best-known material in which to suspend the sensitive silver bromide. Experiments with egg albumin have had some interesting results, but have not shown this to be as good as gelatin. His recent studies have, therefore, been limited to gelatin plates. It is well known that the

sensitiveness of an ordinary silver bromide is increased by increasing the coarseness of the granulation. Knoché, however, believes that the sensitiveness is not wholly a function of the response of the emulsion to light, but also of the response to the developer. By this, presumably, he means to assert that two emulsions might have the same impression of latent image, but one respond better to the action of given developing solution, so that it would give a stronger picture, other conditions being equal. This is rather an abstruse question. Liesegang has taken somewhat similar ground. As a matter of fact, the larger granulations have a total surface of less area than the smaller granules, so that less susceptibility to the action of the developer should be expected in the former case. It is well known that the activity of colloid masses is related to the enormous surface exposed. Plates are, however, in the market which show high sensibility and yet have a finely granular emulsion. The methods by which these are prepared remain trade secrets. They do not seem to be made by ordinary methods.

The usual method of preparing the sensitive emulsion is to bring together the silver salt and bromide in the presence of gelatin, with association of ammonia, of which latter the proportion may differ within wide limits. Cohen has shown in an article in Eder's *Jahrbuch* that all the silver bromide possible to be formed from the salts used is practically at once formed. If the reaction could be delayed, that is, the bromide and silver salt restrained so that some time would be required for the formation of silver bromide, it might be possible to have it ripen as formed. To secure this result, organic bromides might be found applicable. These react but slowly at best. It is now known why this is the case. Sodium chloride reacts promptly with solution of silver nitrate because both *ionize* to a great extent, and their atoms are respectively free to act on one another, but ethyl chloride does not ionize appreciably, and, hence, its chlorine is not free to act on the silver, nor is the organic radicle (ethyl) free to associate with nitric acid radicle of the silver nitrate. Slight increase of temperature may in some cases promote the chemical action. By such a method, silver bromide will be formed slowly, and have in this period of formation opportunity to take a physical form that will give higher sensibility. If this plan is successful, several advantages will result.

1. The formation and ripening of the sil-

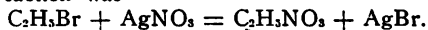
ver bromide will proceed simultaneously. The desired fineness of granulation will be obtained with high sensitiveness.

2. If moist silver oxide can be used with, say, ethyl bromide, the result will be silver bromide and ethyl alcohol, which latter can be left in the emulsion, thus avoiding long washing.

3. Finally, if ammonio-silver compounds are used, the decomposition will give rise to ammonia derivatives, which will do away with the necessity of treating the emulsion with ammonia.

These considerations are attractive, and make the investigation worth while, but the preliminary experiments showed that the problem is by no means easy to solve. As bromine is held pretty firmly in many of its organic compounds, a careful selection was necessary. The first suggestions were of the familiar methyl and ethyl bromides. The first named is inapplicable on account of its very low boiling point. A difficulty lies in the fact that the bromides of this class are not appreciably soluble in water, which, of course, can alone be used as a solvent in such work. Moreover, a complete reaction rarely occurs, so that both salts may remain as excess, necessitating thorough washing, in which condition advantage number two is lost.

In the first experiment, ethyl bromide and silver nitrate were brought together in a gelatin medium, although a collodion solution would have served better as far as the bromide is concerned. On account of the high volatility of ethyl bromide, and the consequent danger of loss of it, the experiment was conducted in a closed flask at a temperature of about 40° C. (104° F.). The results did not conform to what was hoped, since the emulsion became strongly red-brown, which seemed to be due to the medium in which the reaction occurred and caused by some of the by-products. The reaction was—



Ethyl nitrate ($\text{C}_2\text{H}_5\text{NO}_3$) is a powerful agent, which evidently acted destructively on the gelatin.

This way led seemingly to no satisfactory result, so attention was turned to the use of moist silver oxide and ethyl bromide, using an excess of the latter. A somewhat better result was obtained, but the emulsion had low sensibility and gave a weak effect. The durability was also low, especially after coating, even when thoroughly washed. Perhaps a portion of the result was due to the fact that ethyl bromide is

not soluble in water, and did not really get into intimate association with the gelatin.

Knoche then tried sodium monobromacetate, with moist silver oxide. An emulsion of satisfactory appearance was produced, but it was but slightly sensitive and not practically useful. The researches were discontinued, but the investigator thinks that better results might be obtained with colloidion mixtures.

Anticipation of Daguerre

It is asserted that in a publication, entitled *Pfennig-Magazin*, in the year 1840, an account is given of a process of copying copper-plate engravings, drawings and writings by contact with a prepared paper. It is claimed that five days before Arago presented to the French Academy the account of Daguerre's process, a certain Mr. Breyer deposited with the Brussels Academy a sealed package containing a statement of his first results, and requested that it should be opened at the meeting of the Academy on the 5th of October of that year. Dr. Limmer, President of the Photographic Institute of the Technologic High School at Darmstadt, is authority for the statements. Claims of this character are often made without sufficient warrant. The publication mentioned is not likely to be found in the United States; nor, indeed, outside of the country of publication. Almost all great discoveries are foreshadowed, and generally by workers who have remained comparatively obscure. Glauber (1604-1668) was aware of the fact that organic substances stained with silver nitrate will turn black when exposed to light.—H. L.

The Saffranin Procedure

Photographic literature is naturally much devoted to the recently announced method of Dr. Lueppo-Cramer, by which even highly sensitive plates can be developed in ordinary light. For the essential particulars, see *PHOTOGRAPHIC JOURNAL OF AMERICA* for February, 1920. Dr. Lueppo-Cramer has just published a book, giving a large amount of data on the subject. He has extended the procedure to some manipulations with X-ray plates. The earlier efforts at desensitizing are discussed. Among these was the use of amidol. The nature of development is also treated.

Concerning the application of the saffranin method to X-ray work, it appears that by incorporating the desensitizer in the

emulsion, it becomes possible to prepare the plates in yellow light, and to convey them from the package to the plate-holder also in yellow light, and to carry on the development under convenient conditions.—H. L.

Development of P. O. P. Papers

Ernest Coustet, in the continuation of an article in the *Revue Française de Photographie*, gives some data on this subject. Noting the early history, he states that in 1852, Blanquart-Evrard discovered that when ordinary silver chloride paper was exposed until a feeble image appeared, this could be further developed to any desired point by gallic acid. He employed the following bath:

Water 100 c.c. (3 fl. oz.)
Saturated solution gal-
lic acid 100 c.c. (3 fl. oz.)
Acetic acid 2 c.c. (1 fl. dr.)

The strength of the acetic acid is not given, but presumably it was the familiar commercial article known still as No. 8. The picture was fixed in a 5 per cent. hypo solution and then immersed in a dilute solution of hydrochloric acid to remove some stains which are apt to appear. The paper is then dried and submitted for some weeks to the action of light, by which the image becomes purplish. The procedure was for some years exploited commercially, the originator having established a factory at Lille. It had some advantage in the fact that the preliminary picture could be obtained rather rapidly.

About the same time, Thomas Sutton used an analogous method, but substantially a citrate paper, according to the following formula:

Filtered rain water ... 30 c.c. (1 fl. oz.)
Common salt 2 gm. (30 gr.)
Freshly expressed lemon
juice 2 or 3 dps.

The solution is filtered and a suitable paper immersed in it for about ten minutes, then allowed to dry. To sensitize, it is floated for a few minutes on a solution of

Water 30 c.c. (1 fl. oz.)
Silver nitrate 4.5 gm. (70 gr.)
Saturated solution of
citric acid 25 drs.

The paper is dried (of course, in darkness) and exposed under the negative until the image is feebly evident, then developed by a solution of 7 grains of gallic acid in an ounce of water (0.5 gram to 30 c.c.).

The application of the developing solution is best done by laying the paper on a

glass plate and pouring the solution over in one sweep, much after the fashion used in developing wet plates with the iron developer. The image begins to strengthen in a few minutes, showing at first in bright red, but toning down gradually to black. It is then well washed, fixed in strong hypo and again washed. De Valicourt observed that development can be hastened by placing the paper on a warm surface.

In 1864, Carey Lea, of Philadelphia, indicated the value of an addition of a lead salt (acetate or nitrate) to the developing bath, and in the following year Albert, of Munich, used pyro in the following formula:

Water	1000 c.c. (1 qt.)
Pyro	1 gm. (15 gr.)
Citric acid	1 gm. (15 gr.)

After development and washing, the picture was toned by a solution of gold chloride and sodium phosphate and fixed as usual.

Von Monckhoven has studied these processes and has observed that the tones obtained are dependent on the coatings on the paper. Paper lightly coated gives weak and dull images, but those carrying gelatin or albumin give brilliant tones. Von Monckhoven claimed specific advantages for a form which he called nitro-glucose paper, which bore some analogy to our modern celluloid. This paper could be developed by either pyro or gallic acid. He employed, in addition, a solution of lead acetate. He claimed that after some practice an image could be obtained practically undistinguishable from a completely printed-out picture.

All these methods have fallen into disuse. The invention of the gelatin-bromide paper put them out of fashion, but in 1892 Liesegang took up the study of them with a view to ascertain the causes of failure, and make them uniformly successful. Liesegang's formulas, however, are applicable only to his aristotype paper; nevertheless, his results are interesting, and as new developers are discovered there will be opportunity for experimenters to study these in connection with the problem here treated.—H. L.

Development After Fixation

As an addition to the article on page 108, March number of the PHOTOGRAPHIC JOURNAL OF AMERICA, the following is important in this connection, as it refers to a discovery made about twenty years ago by

Professor F. E. Nipher, of Washington University, St. Louis, Mo. In 1901, he published in the Transactions of the St. Louis Academy of Sciences the results of experiments on very long over-exposure. Giving, for instance, plates that required only a fraction of a second, several hours' exposure, necessarily to a fixed object, he found that not only was the picture reversed, a fact already known, in a general way, but the development could be made in full light; in fact, must be so made, for if developed in darkness the plate will fog. Nipher's experiments were repeated a few months later by members of the Photographic Section of the Franklin Institute, Philadelphia, and the results were exactly as had been described. A rapid plate, which had been given four and one-half hours' exposure, was passed around a lighted room for the examination of those present, and then developed in front of a sixteen-candlepower electric light, while another plate, similarly exposed, but which had been developed in the dark-room, was fogged. The plate developed in the light, on being fixed, came out as a perfectly clear positive.—H. L.

Some New Directions for Photographic Research

By JULIUS RHEINBERG, F.R.M.S., F.R.P.S.

Photography as we know it originated with the observation of the fact that the action of light produced chemical alterations in a light-sensitive film, and it is not unnatural, therefore, that the study of photography and photographic processes has in the main been the study of making use of these chemical changes to best advantage. Research on the preparation of emulsions, developers, toning and fixing agents, and the methods of using them, has been chiefly concerned with the utilization of the *chemical* changes by light on the light-sensitive film and turning it to best account to obtain the desired results.

The *chemical* action of light on the photographic film, however, is nearly always accompanied by some *physical* change in the colloid vehicle also, or perhaps it would be more correct to say that it is invariably accompanied by some such physical change. The physical changes may be of various kinds, and not being usually very pronounced, this side of the subject appears to me to have perhaps received less attention than it deserves. I propose this evening, therefore, to bring to your notice some ob-

servations and results obtained in investigations which I have carried out at various times for specific purposes, showing how these physical changes in a photographic film, which accompany the chemical changes brought about by the action of light, may be made use of in new ways. I am hopeful that this may stimulate discussion, and serve to show that it points to new fields of enquiry worth following up in other directions.

A few instances of marked physical changes in a film accompanying the action of light are familiar to everyone present: they have been known for a very long time, and have been exploited in various practical photographic processes. Perhaps the most familiar instance is that of the action of light on gelatine or albumen containing the proper amount of potassium bichromate. The bichromated gelatine becomes insoluble when acted on by the light, and the portion not acted upon remains soluble and may be washed away, and there are various important processes dependent on this fact. Although in this case the whole nature of the sensitized film has been physically changed by the action of light concomitantly with the chemical change that has occurred, attention would not usually be focused on this physical alteration, as I suppose that questions of solubility and non-solubility would usually be regarded rather from the viewpoint of chemical change.

A more pronounced case of physical change is afforded by the instance of the difference in the swelling properties of photo-sensitive gelatine films, the reliefs so obtained having been exploited for various photo-mechanical processes.

Again, certain processes, as instanced by collotype, have been founded on the differential adhesive power of the exposed and unexposed parts of bichromated gelatine films, the differential adhesiveness for greasy substances being itself dependent on the differential power of absorbing moisture of the exposed and unexposed parts.

Lastly it has been found that by chemically treating exposed films, the exposed and unexposed portions may be made to absorb certain dyes selectively, and certain processes have been founded on this fact. This, however, again would probably be regarded rather from the chemical than from the physical standpoint.

So far as I am aware, the instances named illustrate the chief directions in which the physical alterations caused by the action of light on photographic films have so far

been utilized, although very likely some other ways may be pointed out by members present in the discussion.

I now come to a different way in which the physical properties of a photographic film may be markedly affected by the action of light accompanying chemical change. It is a way I set out to obtain, and was successful in obtaining and utilizing in researches on a new method of color photography, to which I devoted several years' experimenting just prior to the outbreak of war.

Without entering into any special details of this process of color photography itself, I need only say that one of the problems that presented itself in connection with the same was how to obtain three-color line or dot screens, somewhat similar to the Paget screens, from which the color lines or dots might subsequently be selectively extracted, *e.g.*, the red dots might need to be extracted wholly, the green dots partially extracted, the violet dots left in, and this selective extraction would require to be brought about at the same time by immersion in a single bath. Now, I was unable to make use of the Paget plates themselves, or, rather, I should say, of plates made by the Paget process, because this process depends on coating the collodion, which is the vehicle of the colored dots, with a photographic resist of bichromated albumen. The Paget process of screen making, as is known, is to expose the collodion film covered with the bichromated albumen resist under a dot screen, then wash away the unexposed parts of the resist, and the collodion on immersion in a dye solution is then dyed up selectively where the unexposed film has been washed away, leaving the collodion free, but is protected from taking up the dye, under the exposed dots of the resist, because these form an insoluble protecting surface. In the final Paget screen plate, of course, the dots in two of the three colors have this transparent insoluble bichromated albumen resist left upon them, and that was fatal for my special purpose. Naturally, I first tried by all sorts of ways whether it was not possible to get rid of the bichromated resist which remained on, but was not successful. I then went on the tack of trying to find some sensitizer for the resist, other than a bichromate: one by which insoluble resist dots might be obtained temporarily which could be converted into soluble ones subsequently, and then washed away. On this tack I was also unsuccessful; moreover, I found that the washing

away of the soluble part of the resist, so as to leave nice clean insoluble dots, was not quite such a simple thing as it reads. I then conceived the idea, why not attempt to die up or extract dye from the colloid vehicle, right through the super-imposed resist film? This idea seemed attainable, provided the permeability of the resist film to the solvent of the dye could be changed by the action of light, whilst the resist film remained soluble, whether exposed to light or not, in some other solvent which would not affect the underlying vehicle of the color dots.

This problem, after innumerable trials, was not only successfully solved, but solved in quite a number of different ways, using various colloids as the vehicle for the color screen and the resist. It will probably serve to make matters clearer if I describe in detail a specific case.

A plate was first coated with a collodion film dyed red, for example. This was coated with a photographic resist made up as follows:

Gum arabic—1 part in 5 of water	1 volume
Green ferric ammonium citrate—1 part in 2 of water.	1 volume
Uranium nitrate—1 part in 2 of water	1 volume

This resist is entirely impermeable to alcohol (industrial spirits) acidified with a few drops of HCl in the unexposed state, but after the action of light on it, it becomes permeable to the spirits.

If, therefore, the plate is exposed for a few minutes to light under a line screen, consisting, say, of 200 opaque and 200 clear lines per inch, and subsequently immersed a few seconds in the acidified alcohol, the whole of the red dye is extracted right through the gum resist, under the lines exposed to light, and a screen consisting of 200 red lines and 200 white lines per inch results.

Next, the plate is immersed in an alcoholic solution of green dye, and the white lines are then dyed up green through the resist. The plate then consists of 200 red and 200 green lines per inch.

Next, the plate is immersed in water, which washes away the whole of the resist, and it is coated with fresh gum resist as before. It is again exposed to light under a line screen; this time a line screen of 200 per inch, with the opaque lines double as wide as the clear lines is used, and this screen is placed with the lines at right

angles to the red and green lines already on the plate.

It is then again immersed a few moments in acidified alcohol, extracting the dyes from the collodion, corresponding to the clear lines of the line screen, and then immersed in an alcoholic solution of a violet dye, which dyes these clear lines up.

Lastly, the plate is again immersed in water, which at once dissolves and washes away the gum resist.

The final result is then a plate with violet lines, and red and green rectangles, all three colors occupying an equal area of the plate.

A few specimens of screen plates of the pattern described and of other patterns which were made by this process in 1913-1914 by myself and Mr. G. C. Laws, who was assisting me at that time, are exhibited this evening. The process, I may say, is patented so far as screen plates are concerned, but has not been offered anywhere, and if any enterprising firm wishes to take it up and will communicate with me, I shall be delighted.

However, to revert to my subject. In the method described with the gum resist, the resist was washed away after the underlying collodion film had been dyed up in two colors, and a second resist applied before proceeding to re-expose and extracting the dye and then dying up in the third color. But gum arabic is by no means the only colloid that can be employed for the photographic resist film. Fish glue could also be used, likewise albumen, and when employing albumen it was even found possible to leave the albumen coating intact after the first dyeing up, simply washing out the water soluble chemicals in the resist, and sensitizing it again by immersion in water containing $7\frac{1}{2}$ per cent. green ferric ammonium citrate and $7\frac{1}{2}$ per cent. uranium nitrate, and then proceeding with the process as described. This perhaps brings home more than anything else that it is purely a case of utilizing the physical properties of the colloid film to bring about the desired result.

It will be seen that when once the general principle of the idea is grasped, it is simply a matter of time and patience to work out all sorts of variations, so long as a few main conditions are borne in mind. These are simply:

(1) The colloids of which the upper and underlying film consist should be of a different nature; for example, the one should be water soluble, the other spirit soluble,

or soluble in some other solvent or mixture of solvents.

(2) The solvent chosen for conveying or extracting material from the underlying film must be one which does not harmfully affect the upper film.

(3) The light-sensitive chemicals in the upper film must be such that only the unexposed parts or the exposed parts, as the case may be, are affected by this solvent, or at all events the action must be very differential on the exposed and unexposed parts.

(4) The solvent for removing the upper film or light-sensitive chemicals must be one which does not affect the underlying film, or dyes or materials in it.

The general idea of action on an underlying material through a super-imposed resist is one which I doubt not is capable of extension in quite a number of directions. I will instance one application of it to quite a different problem than the one already referred to.

Shortly after the outbreak of the war, I had, unfortunately, to give up my experiments in color photography, as Professor Cheshire, of the Ministry of Munitions, asked me to see what could be done in the way of devising some good process for the production of "Graticules" (which, as most of my audience know, are the glass discs or scales with extremely fine lines on them, used in military and other sighting instruments). It was an urgent problem, since we had been chiefly dependent on Germany for these products, and, except for some very primitive methods, not at all suitable to mass production, the processes, monopolized by one or two German firms, were kept secret.

Some photographic method appeared to be the only feasible one, and, after first attempting a dyeing-up method, which it was quickly seen offered no prospects of success, I decided to attempt an etching method, based upon the idea of differential action through a resist, which was subsequently to be washed away. The principle was, of course, just the same as in the previously described method, but the factors were much changed, because now the underlying film was the glass itself, and the solvent to act on the underlying film would no longer be a fluid, but hydrofluoric acid gas. I need not dilate at length on the matter, suffice it to say that after a great many experiments it was found perfectly possible to apply the principle.

In this case, it turned out that the most suitable upper resist film was collodion con-

taining an iron salt, and subsequently sensitized in an alcoholic solution of silver nitrate. Results were also obtained with water soluble resist films on albumen, fish glue and gum arabic, but for the purpose in question the collodion resist gave the best results.

Now, it is quite true that these graticules were not eventually used, because, firstly, it was found impossible to get the resist so perfect as to prevent some microscopic pits on the surface of the glass, where they were not wanted; secondly, because the nature of the etched lines did not meet the optical desiderata; and, thirdly, because very shortly after these experiments all desiderata were fulfilled by the method of grainless photography, examples of which I had the pleasure of exhibiting at our last year's annual exhibition. That, however, does not alter the fact that the principle of etching in this way has been found quite workable, and for aught I know might usefully be applied to work of a less delicate and exacting description than that demanded by graticules.

The last matter to which I will refer this evening is the different physical properties of colloid films, according to the solvents with which they have been produced, and with which they may be treated. From the theoretical standpoint there is little, if anything, new in what I have to say: it is the practical applications which I wish more particularly to refer to, because I venture to think that certain simple fundamental facts, often very helpful in dealing with photographic problems, are not infrequently apt to be overlooked.

Now, the physical properties of the film resulting from a colloid in solution depend, amongst other things, on the rate of evaporation of the solvent or solvents, as well as on temperature. When two solvents, which evaporate at varying rates, are employed together, the resulting film has a tendency to be deposited in a more irregular manner than when it is evaporated from a single solvent. This principle is occasionally made use of in producing matt screens with fine grains or particles in the colloid varnish: the greater or less regularity of distribution of the grains of which the film is formed can be regulated by varying the two solvents and varying the ratio of one to the other. Another point is that thick colloidal solutions with two such solvents do not flow so smoothly or easily as solutions of similar concentration in which a single solvent is used; they tend to form

ripples, or thicker and thinner places. Now, that is just one of the difficulties which occurs with collodion, which for photographic purposes is almost invariably made by dissolving the pyroxylin in a mixture of ether and ethyl alcohol, neither of which separately will dissolve it. Further, the considerable difference in the rate of evaporation of the ether and alcohol also vary with difference in temperature, and it is well known that the proportions used are different in winter to summer. And the resultant film has varying degrees of density or porosity, according to the ratio of the solvents. To coat plates by hand with such collodion mixtures is an art. It can, of course, be done, and done very perfectly; for example, I had reason to admire Mr. G. C. Laws' adeptness at such work. But personally, I could never coat a plate properly with ordinary collodion.

It is now seven or eight years ago that it seemed to me very desirable to find another way of making collodion for photographic work, either with a single solvent, or, at least, with two solvents having a much smaller difference in the rate of evaporation than ether and ethyl alcohol. A suitable single solvent was found in the use of pure methyl alcohol, which will by itself dissolve celloidin, or any of the usual photographic forms of pyroxiline. The collodion film formed by such a solution is, however, slightly opalescent, showing that the structure is comparatively coarse, that it is very porous and not as dense, therefore, as ordinary ether-alcohol collodion. This, it was found, could be altered by adding to the made-up solution a certain quantity of ethyl alcohol, the rate of evaporation of which is comparatively close to that of methyl alcohol. The more ethyl alcohol, up to about 50 per cent., that was added, the denser, the less porous and the clearer became the film. It is, therefore, easy to produce a film having controlled and regulated physical properties in these respects.

As to coating plates in a smooth and regular way, it is as simple and easy to do it with either the methyl alcohol collodion or the methyl alcohol, plus a moderate proportion of ethyl alcohol collodion, as it is difficult to do it with the ether alcohol collodion—a novice can do it at once. But to have a film which possesses known properties as regards density and porosity is not sufficient, for it may be highly desirable that during the processes of photographic development or intensification such physical properties should be varied or made the most

of—I have found this extremely necessary in the case of several processes worked out during the war—and with a collodion film of the nature described nothing is simpler. If you require the film to be temporarily more porous, all you have to do is to put it in a bath of water and spirits, the amount of spirits determining the degree of porosity you will obtain. The time of immersion is not of great importance, as it very soon swells to the amount it is going to swell. As spirits, *i.e.*, ethyl alcohol, will not dissolve the film by itself, you may immerse it in spirits alone for obtaining a fairly considerable increase in porosity. If that does not suffice, methyl alcohol may be added to the spirits, up to 25 per cent., to produce increased swelling or porosity. But if you go very much beyond this, although you do not dissolve the collodion, you begin to disintegrate it, and with spirit baths containing 15 per cent. or 20 per cent. of methyl alcohol, the time of immersion does tend to become a factor.

I have recently patented the use of methyl alcohol for certain special photographic emulsions, to which I have not referred this evening, but it seems to me that with the necessary research it might easily be found very useful and adaptable for other purposes, one which suggests itself immediately being the wet-collodion processes, for example.

However, my main point this evening is to suggest that the whole subject of the physical properties of the colloid films, with which photographers have continuously to deal, the bringing of these properties in to greater service, or new ways of utilizing these properties, is a field of research which will well repay greater attention than has perhaps been devoted to it.

Curiously enough, at a time when this paper was nearly written, the symposium on "Colloids," arranged by the Faraday Society and the Physical Society, took place, and I there heard Dr. Emil Hatschek, whom many here present will know to be one of our leading authorities on colloids, make almost the same remarks as to the necessity of, and the advantage to be derived from, the further study of their physical properties. It was a quite general statement on his part, not related specially to photography, as, in fact, amongst a large number of papers read on that occasion, relating to many branches of industry, there was none dealing with photography.—*Journal of the Royal Photographic Society.*

Clearing Autochromes and Fixing after Intensification

WHEN it is necessary to intensify an Autochrome transparency (and it may be said this is almost always beneficial), the process is generally followed by a clearing bath, composed of a solution of potass permanganate. It is then essential to fix the plate in an ordinary hypo fixing bath in order to ensure the permanence of the intensified image. In this connection a warning may be given. The plate must be washed quite free of the permanganate solution used for clearing before it is put into the hypo bath, for if any of the permanganate solution remains in the film, the action of the hypo in conjunction with it has a very rapid reducing action upon the transparency, both in depth and in the brilliancy of the colors. Care must be taken to see that this possibility is avoided, and the plate should be given at least three minutes' washing in a gentle stream of water, in order to remove all trace of the permanganate before it is put into the fixing bath. This fact was brought to my notice very forcibly recently. Being pressed for time, I was tempted to shorten the washing of the cleared Autochrome which I had intensified, and had placed in the fixing bath after only a very brief rinse. The result of less than half-a-minute's immersion was that the image was greatly reduced, both in depth, contrast and the brilliancy of the colors, and to such an extent that the deep mauve tint of some asters—the subject was a flower study—was only just a little off a white, and all the time spent in intensification was thrown away.—R. M. F., in *B. J.*

Studying the Picture Upon the Ground-glass

It is good practice to study the composition carefully as it is projected upon the ground-glass screen of the camera. We advise such practice, because it is one usually neglected. The photographer composes mentally the composition from the original scenery, notes its peculiarities, good features and whatever else seems contributory to effect, and then with a casual glance at the projection upon the ground-glass, merely to see the special dimensions, proceeds to take the impression.

The thing upon the ground-glass is the picture he will get, not his mental perception of the original, and it is something

different. The photo artist can get effects only by studying how to get them upon the ground-glass. The way to study is both analytical and synthetical, in piecemeal and in entirety. He must see the individuals in the whole and see also how the individuals contribute to the unity they make.

In looking upon the ground-glass our attention should not be directed to any one part to the exclusion of the others. Each thing in order to be in proper relation with the rest must have its proper proportion of light and shade.

The illumination must be proportional throughout the scene.

It is just the same relation in the distribution of light and shade in a composition by art which must be observed as is analogously maintained in music.

In a picture, where the light key is pitched high, unless the shadow in it is equal in quantity, the effect is garish and unpleasant. Corot delights in brilliancy, but he knows how to balance with shadow. Murillo, though he makes use of a good deal of shadow, always sets it off with contrasts of high-light.

It too often happens that the imitator of good photographic art imagines that he is getting there by smudging over the high-lights and securing an even tone throughout, but if he studies his copy he will see that the suggestion of evenness is due to skilled manipulation of light and shade and that the high-lights and shadows are equally pure.

When looking on the ground-glass, see that the point from which the high-light proceeds is maintained throughout the whole.

There should be only one point from which the illumination should come, but there should be a center of light in the picture itself from which all the other subordinate lights radiate.

A Copying Suggestion

MANY photographs that are copied give evidence of the fact by lack of clear high lights or a general flatness. This can be obviated by intensifying copy negatives in the chromium intensifier. In some cases the copy by this means is an improvement on the original; and, in any case, the method often removes the need of employing a special plate for the work in hand.—B. J.

Recent Patents

1,367,268. *Film-Stopping Device*. A film-locking device, comprising a spool having a flanged end with notches therein, a slide mounted to move across the end of the spool, said slide having an upturned end, a pin in said upturned end engaging with said notches to lock the spool.

1,367,109. *Motion-Picture Apparatus*. Motion-picture apparatus having, in combination, a plurality of motion-picture machines with a motor for each, a dowser for each machine, and means for automatically closing the dowser of either machine and opening the dowser of the other and for starting the motor of the machine on which the dowser is opened.

1,369,515. *Multiple-View Camera*. In a multiple-view camera, a holder for a photographic plate, means for imparting thereto a horizontal reciprocating movement, means automatically effective at the end of the horizontal movement to cause the plate-holder to be shifted in a vertical direction, and manually actuated means to render the vertical shifting means inoperative while the plate-holder continues to be reciprocated horizontally.

1,369,560. *Photographic Printer*. A photographic printer, comprising a supporting structure; a light box fixed in said structure; a luminous source fixed in said box; means for supporting a negative over said box; means for holding a strip of sensitized paper loosely in contact with said negative; a platen normally held above said negative; means for forcing and holding said platen against said paper; means for energizing said luminous source when said platen is so pressed; rollers for feeding said paper across said negative; a rack secured to and moving in synchronism with said platen; a gear wheel mechanism driven by said rack; and means by which said gear wheel actuates said rollers.

1,369,127. *Moving-Picture Camera*. In a moving-picture camera, the combination with the reel arbor suitably journaled at the rear of the casing, the reels and casings therefor, the film and the pulley secured to the reel arbor between the reel casings of the main driving arbor journaled at the front of the casing, a pulley located centrally on the main driving arbor, a belt connecting the two pulleys, and a double gear pin wheel secured on the main arbor at one end

thereof, a helical driving gear for the shutter mechanism, secured on the opposite end of the main arbor, and a double gear pin wheel eccentrically journaled with respect to the center of the driving arbor and between the rims of which the helical gear is located and a driving means between the double gear pin wheel and the helical gear.

1,370,776. *Photographic View-Finder*. A view-finder for a camera, comprising a finder lens, a screen rotatable about the axis of the lens for assuming different positions with different positions of the camera, and a field defining device associated with the finder lens and maintaining a fixed relation with the finder lens when the screen is turned.

1,370,842. *Photographer's Portable Light*. A light of the character described, comprising super-imposed hingedly connected casings, the upper ends of the casings being narrower than their lower ends, means carried by the lower ends of the upper casing for the reception of a support, lights disposed in the casings and supported on their wide sides and a diffusing screen disposed in front of the lights.

1,370,922. *Photographic Film*. As an article of manufacture in combination, (1) a flexible photographic film, comprising a flowed nitrocellulose sheet, containing aliphatic alcohols of from 4 to 5 carbon atoms and sufficient castor oil to enhance the flexibility of said sheet, (2) a light-sensitive gelatino-silver haloid photographic emulsion and (3) a substratum layer intermediate said sheet and said emulsion, and firmly interuniting them, whereby separation of said emulsion from said sheet during normal photographic use is prevented.

1,371,010. *X-Ray System*. In an X-ray system, a source of alternating current, a transformer with its primary connected to said source and a secondary, two leads running from said secondary, two X-ray generating tubes with two wires from each of the same, and oil immersed means in the transformer for connecting the two leads of the secondary with the corresponding two leads of either, but not both of the X-ray generating tubes at the same time, which means is so arranged and disposed that either tube may be connected and the other disconnected at the volition of the person operating the apparatus.

1,367,409. *Process of Producing Ferrous Oxid.* The process of producing ferrous oxid, which consists in forming an iron salt by subjecting iron within a cell to the acid product of the electrolysis of an aqueous solution of a salt, and converting said iron salt to ferrous oxid by the action of the alkaline product of the electrolysis of the said aqueous solution.

The Action of Soluble Iodides on Photographic Plates

F. F. RENWICK, A.C.G.I., F.I.C., F.R.P.S.

THE modern dry plate consists of a sheet of glass bearing a film of gelatine in which are embedded countless minute grains of silver bromide. The silver bromide generally contains a small proportion, ranging from 2 to 10 per cent. of silver iodide, forming with it a homogeneous mixture, or, as it is sometimes called, a "solid solution."

Both salts are remarkable for their extremely small solubility in water, silver bromide requiring nearly ten million times, and silver iodide from 500-1,000 million times its weight of water to dissolve it. Silver iodide would probably be incapable of existence were it not for this extraordinary insolubility; it would spontaneously decompose into silver and iodine when dissolved, for the two elements are very weakly held together. Iodine, however, is an element having well-marked polyvalency, and readily unites with other substances containing iodine, as is shown by the ease with which silver iodide dissolves to form double salts AgI.KI and AgI.2KI in strong solutions of sodium or potassium iodide, and the obstinacy with which it retains these salts or even free iodine when brought into contact with their weak solutions. No amount of washing will remove the last traces.

From these remarks it will be evident why silver bromide when bathed in a soluble iodide is rapidly converted into the far less soluble silver iodide, and why, if the iodide solution be strong, the iodide of silver dissolves in it. One hundred c.c. of a 30 per cent. solution of potassium iodide will dissolve about 3 grams of silver iodide and stronger solutions a still larger proportion of AgI to KI . Consequently, it is not difficult to fix a dry plate in a potassium or sodium iodide solution of 20 per cent. strength.

Apart from its cost, however, such a fix-

ing bath suffers from the serious drawback that it causes softening or even melting of the gelatine film, unless the latter has been well hardened first.

Even in very dilute solutions of soluble iodides the conversion of solid silver bromide to iodide is singularly rapid and complete, provided there is enough solution present. Precipitated silver bromide is completely changed to iodide by excess of a 1 : 5,000 solution of potassium iodide, while a 1 per cent. solution will completely convert the silver bromide in a dry plate to iodide in a few minutes at normal temperatures, provided sufficient solution is used to cover the plate well and it is kept moving.

In a lecture delivered last March before the Liverpool Section of the Society of Chemical Industry (*Journ. Soc. Chem. Ind.*, Vol. xxxix, No. 12, p. 156r, and *Brit. Journ. Phot.*, lxvii, pp. 447, 463), I described and demonstrated certain experiments concerning the action of soluble iodides on the latent image. It was shown (1) That it is possible to fix an exposed plate in a strong iodide bath, and after washing out the salts to develop an image in silver by means of any of the well-known physical developers, and (2) that it is possible to develop an exposed plate in an alkaline amidol solution after the whole of the silver salts in the plate had been converted into iodide. A suitable bath for this purpose is:

Sodium or potassium iodide	10 gms.
Cryst. sodium sulphite	20 gms.
Sodium or potassium sulphocyanide	30 gms.
Water up to	1000 c.c.

With the assistance of my colleague, Mr. Olaf Bloch, the influence of numerous salts and other substances in various proportions was tested in order to discover the composition of a bath which would entail the least loss of image by the treatment. Certain hardening and anti-swelling agents, *e. g.*, formalin, sodium acetate, etc., were found useful for counteracting the softening action of the sulphocyanide on the gelatine. An addition of 1 to 2 per cent. of potassium bromide appeared to preserve the delicate half-tones to some extent, as did also 2 per cent. of gum arabic, 10 per cent. of alcohol, or the addition of a drop or two of weak silver nitrate, sufficient to yield a faintly turbid solution, but no great improvement on the simple formula given above was found, provided it is used quite cool (55 degrees to 60 degrees F.).

The sulphocyanide has a marked influence on the subsequent developing process, greater density and detail being obtained when it is used. It undoubtedly modifies the physical character of the silver iodide formed in the process, and its effect is probably related to this fact. The chief use of the other additions mentioned seems to be to slow the reaction; slower conversion to iodide invariably led to more complete preservation of the image. One of the interesting features about these iodized plates is that they are so insensitive to light that they can safely be developed in a strong white light without fogging, except when certain developing agents are employed. The most notable of these exceptions is hydroquinone, which has a well-marked sensitizing action on silver iodide, and causes it to fog in a light in which alkaline amidol is a perfectly safe developer. Development of the iodized and well-rinsed plate in an alkaline amidol developer requires a long time to attain completion, but ten minutes at 65 degrees F. is usually sufficient for a plate which, when used in the ordinary way, would give average density in about four minutes in a normal pyrosoda developer.

The formula we adopted was:

Amidol	20 grains
Soda carbonate, cryst.	1 ounce
Soda sulphite, cryst.	1 ounce
Water	10 ounces

In the course of these experiments the remarkable fact was discovered that similar quantities of sodium thiosulphate (hypo) could be substituted for the sodium or potassium sulphocyanide in the iodizing bath, with at least equally good results, provided the iodized plate was not exposed to white light before development, but that if, while the iodizing solution was still in the film, the plate was exposed to white light, the latent image was to a large extent destroyed. This led me to try the effect of exposing in the camera a plate which had been well exposed to diffused light and then iodized, with the result that it was found possible to obtain direct positives in the camera by this process, which was also described and shown at Liverpool last March. The reversing action of soluble iodides on latent images on AgI in collodion had been known since the time of Poitevin in 1859, but here we have a latent image, formed originally in silver bromide, then transferred to silver iodide and found

capable of destruction by light in the presence of soluble iodides, with the additional interesting fact that the latent image is far more sensitive to light if thiosulphates are also present. The same effect is observable in a plain iodide, or iodide and sulphite, solution to a smaller degree, while sulphocyanides appreciably retard the reversing action.

A recent private communication from Dr. Lüppo-Cramer informs me he has since found that after destruction of the original latent image in this way it is possible by further very prolonged or intense exposure to form a new latent image, a result of considerable interest if not altogether unexpected.

I now come to the most recent outcome of these experiments, and one not hitherto published. Since Lainer's discovery in 1891 of the remarkable effects of minute additions of iodine to alkaline developers, von Hübl, Lüppo-Cramer and other workers have made a fairly thorough qualitative study of them, both with iodine tincture and alkaline iodides; and Sheppard published a valuable quantitative investigation of the subject so recently as January of this year in our *Journal* (*Phot. Journ.*, 1920, p. 12). In that paper he describes and illustrates what he believed to be a fogging effect of very dilute solutions of potassium iodide when applied for a few seconds to the film of an ordinary dry plate. Moreover, he attributes the fog to a nucleus infection of the bromide particles, though of what kind is not very clear.

My observations led me to doubt his explanation, so I repeated his experiments, with the result that I find soluble iodides to have no fogging action whatever, *provided that the plate both during and after bathing in the weak iodide solution is not exposed to orange or red light.*

Further experiments soon conclusively proved that the effect of these extremely weak iodide solutions (which may be as dilute as 1 part in 50,000) is to render the plate markedly orange and red-sensitive. This may readily be demonstrated by exposing a treated plate, bathed for 15-60 seconds in 1:20,000 potassium iodide and subsequently washed in water, to the spectrum. To assist in locating the regions of the spectrum an exposure on a panchromatic plate is interpolated between those of the untreated and treated ordinary plates, the lines crossing this spectrum being the green and two yellow lines of the mercury

arc, the yellow sodium D line and the lithium line in the red.

So far as I know this is the first recorded instance of color-sensitiveness being conferred by bathing a plate in a colorless solution. Naturally, the correct explanation of such a curious effect is much to be desired. For the present I prefer to leave this point without discussing its obviously important bearing on the latent image problem.

A fair number of salts have been tried in the hope of discovering others capable of doing the same thing. So far, only one other has been found, namely, a weak solution of sodium or potassium cyanide. In strengths ranging from 1 part in 2,000 and up to 1:10,000, the effect is exactly similar in character to that obtained with iodides. It seems clear, however, from the similarity of the effects of two such different classes of salts as iodides and cyanides that the conferred red-sensitiveness must be due to a change within the silver bromide or bromide and iodide grains rather than to anything akin to ordinary sensitizing by dyestuffs.

There is evidently an immense field still open to those photographers who do not possess the advantages of a well-equipped laboratory in the prosecution of such relatively simple experiments as I have brought to your notice tonight, and I trust that many of our members may be induced to try for themselves to enlarge the boundaries of our knowledge concerning such remarkable phenomena.—*Journal of the Royal Photographic Society.*

Exposing Bromide and Gas-Light Prints

ALTHOUGH electric light is now obtainable in most towns, there are still some photographers who have perforce to use gas, or oil, for exposing bromide and gas-light papers. The question of exposure is so important that we think a few suggestions on the subject may be helpful.

Dealing first with bromide printing, we find there is a tendency amongst some printers to use an exposing light (electric) which is far too powerful, necessitating very rapid exposures. In some cases, this is done to "speed up" the work, but we doubt if there is any advantage in quickness when we take into consideration the time occupied in reprinting "spoils." It is easy to make a 50 per cent. error in very short exposures, and we strongly advise

printers to screen down the light, or use a lower candle-power lamp, so that the exposures average 3 to 5 seconds.

Exact data as to exposure cannot be given, as there are so many factors to consider, but a great deal of help can be obtained if the negatives are graded by the printer himself who should also choose the grade of printing paper. When possible the grading of negatives should be done in daylight, so as to make allowance for the color of the image. Printers will find this task very difficult in cases where, owing perhaps to a careless assistant, less than the usual amount of sulphite has been put in the pyro developer used for the development of the negatives, thus causing the image to be of a yellowish color.

In printing by electric light, the exposing box should be fitted with a switch, which is either worked by the foot or by the contact of the pressure pad. The switch must be of a definite make and break type, somewhat similar to the ordinary house switch, but we do not recommend the type of switch that is inclined to "arc" or burn up. The exposing box should have a "spy hole," so that the printer can be quite certain of the correct action of the switch, and it also acts as a guide in counting the exposure seconds. In some towns the electric light loses some of its intensity about the time when theatres are lighting up, and allowance must be made for this.

Printing on gas-light paper offers no difficulties to those who have electric light, but the printer who has only gas or oil at his disposal can use daylight by fitting up a room with a simple exposing device.

A window can be blocked up completely, with the exception of a space of, say, 20 inches square, and against this space can be put a printing-box open at the back, but containing a reflector at an angle of 45 degrees.

There should also be a reflector outside the window at an opposite angle to the reflector in the printing-box. The exposures should be made by a shutter similar to the roller-blind shutter.

In conclusion, we should remind our friends that the first essential in bromide printing is correct exposure, and every possible device or precaution should be used to ensure correctness. In gas-light printing, which has been prophetically described as the "contact paper of the future," there is more latitude in exposure.—*Rajar Trade Notes.*

Detecting Picture Frauds

The day of the forger of old masters seems to have come to an end. An infallible test of genuineness is said to have been discovered. It is to have pictures photographed with X-rays. Recently at the Academy of Sciences the report of Dr. Andre Cheron on his experiments was presented and photographs were submitted showing results.

One picture of Van Ostade, of men drinking at a table, when submitted to the X-ray test showed that it had been painted over a study of dead birds. Another, of a royal child of France of the fifteenth century, now in the Louvre, when photographed showed that a black surface had been painted about 100 years ago over a picture of yet earlier date.

A third example was of a crucifixion by Engelbrechtsen, which was believed to be genuine. Unfortunately, the X-rays showed that below the figure of a woman had been painted the figure of a monk by an earlier artist.

The proof in the test lies in the fact that the X-rays can show what kind of paint had been used, and to what period it belongs. The old masters used metallic paints, which hold the rays much more visibly than the vegetable paints of nowadays.

Also there is a difference in the glaze used, which immediately dates the picture. The old glaze was much more transparent than the modern and tells at once the date of the picture when submitted to the test.

Depth of Focus Curvature of Field

The modern type of lens presents great advantage over older types in giving equality of definition over a flat field, but the question may be put, is this special advantage an invariable desire?

Frequently, an ordinary medium angle doublet, like the old type portable symmetric, often accomplishes in exigency what the improved type cannot.

Where depth of focus is the great desideratum, curvature of field is often better than flatness, and a concentric lens tested in such a case will fall short of what is expected of it.

If the subject to be taken is flat, then, it is advantageous to use a lens with a good flat field record, but when the subject approaches the camera on both sides and at the top and bottom, as is presented in a

good many interior views, a lens giving a curved field is the better.

A distant subject, where the things presented are pretty much in the same focus, is best presented by a lens giving a flat field, and where a subject consists of a series of flat surfaces, such as a range of terraces or of a practically flat expanse of country, then a flat field is just what is most wanted, because its use means the getting of all the objects along any line parallel to the horizon in equally good definition and as the new types work with larger apertures, it is of advantage to use such, especially for short exposures.

It is well to consider in the taking of any subject its character and to adopt the lens to it accordingly and not to expect too much of a lens which is paramount in the performance of its specialty.

Beginners find some difficulty in understanding why a lens of short focal length makes hand camera work so much surer than when a lens of some focal length is employed.

The field in which different objects might be placed and yet appear practically sharp, is much greater in the case of lenses of short foci, even when the distances of the objects in the two cases are such that the same size of image results. Size of image is proportional to focal length, but depth of field increases as the focal length diminishes and not in a direct proportion, but in a constantly increasing ratio.

Depth of field is dependent upon focal length and working aperture; the two factors which determine hyper focal distance, or fixed focus and also the distance of the objects focused. Although the various anastigmats are invariable when fine definition is required over the whole field, we must not forget the exquisite definition a good portrait lens will give over a small area, which is all that it needs to do.

Retouching and Spotting

SHOULD slight spotting be necessary on glazed prints, a simple method is to press the pencil point into the cork of the medium bottle and directly apply the point to the print. Quite a fair-sized surface can be handled in this manner, and the effect of applied retouching medium be avoided.—*F. N.*

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CONDITIONS CONTRIBUTORY TO THE FADING OF THE PHOTOGRAPH

A REASONABLE degree of permanency of the photographic image is expected of any process of reproduction, and so the practical photographer or, in other words, the man who practices photography for a livelihood is compelled to eschew any method which does not insure permanency of result, no matter how excellent the product evolved.

When the "combined bath" for printing and toning was first introduced it met with universal favor because it was not only a labor-saving device, simple and quick, but also by reason of the beauty and variety of tone it afforded.

But it was not long before complaint was voiced by many of the risk run from the fugivity of the photographic image, even when care is exercised in the making of the print.

To be sure the subject has involved controversy, and the exponents of the combined bath contradict the aspersions, maintaining that the finding is to be attributed to careless manipulation, not to the method itself, if rationally exploited.

But the professional photographer cares little about the disputes of the doctors; preferring assurance of reasonable permanency and he feels that the recompense for his expenditure is hardly great enough to warrant restriction of product to insure positive permanency.

It may be worth while, however, to briefly consider what are the factors contributory to permanency, or perhaps we should say, what are the conditions militating against the integrity of the photographic image.

It has always been a popular test with practical photographers, for permanency, to subject the finished photographic print for considerable time to the influence of the direct rays of the sun, and to deduce from the effect pro-

duced upon the color the chance of its ruin or escape from subsequent action of strong light.

This test, however, is very superficial and untrustworthy; and, in fact, is a delusion and a snare to anyone confiding in it, because it resolves the whole responsibility of the fading upon the action of light and fails to take into account the subsequent action of other agents liable to act deleteriously upon the print.

Most any photographer can show prints which have been exposed a long time to the action of light on the walls of the studio which give no evidence of loss of intensity, while others, preserved in albums, have faded considerably.

The action of light on the print should rather be of secondary consideration when the question of permanency is involved in the discussion, inasmuch as light is a factor to be taken account of independently of what is the surface it may act upon.

It is an established fact that pure paper fabric (uncoated with light, sensitive material) changes its color materially when subjected to the action of light. We have seen a negative picture on the plain paper backing of an engraving in a frame which had been hung up upon a wall receiving a rather strong illumination. We all know, too, how soon a newspaper turns yellow.

These changes in the ordinary papers (the basis of the photographic printing papers) ought to be taken into consideration, and not be confounded with the actual fading of the print from the chemical change effected by light.

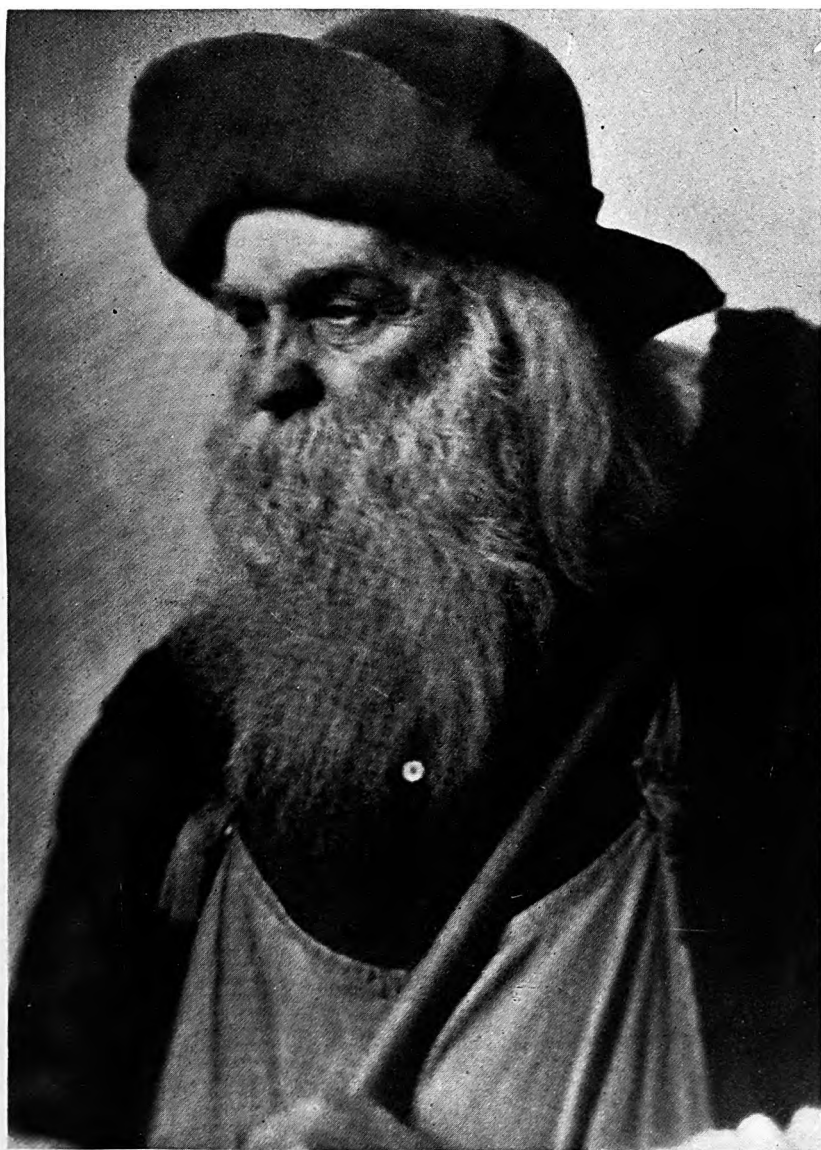
Let us then try to get down to the facts necessary to know if we want to study the causes—or let us be more cautious and say, possible influences. The alchemists classified the metals as noble and base the title of nobility being dependent upon the power of resistance of atmospheric and other extraneous injurious action. Gold and platinum, as is well known, remain unaffected for years, while copper, iron, zinc, etc., soon yield to invasion.

Silver might be put in the same category with gold and platinum if it could exorcise one bad agent, to wit, sulphur.

The slightest trace of sulphurous gas in the atmosphere tarnishes silver, and a few minutes' immersion of a silver spoon in mustard or even in a soft-boiled egg suffices to produce iridescence upon its surface from the slight content of sulphur present.

Our atmosphere has constant presence of sulphur emanations from gas, burning coal and numerous other sources, and it is to this content of sulphur that the deterioration of the silver based photographic print is ascribed.

But just here comes in the question which must be met when the change is made against silver for its susceptibility to attack. Why is a printed out picture (P. O. P.) more prone to fade than a developed bromide print? Both have a basis of silver, but there is a difference physically in the character of the silver. The influence of the state of division of a body in its behavior with other bodies is an established chemical experience. Where a gas, for instance, is brought to act upon a solid, the action is made more immediate and more complete when the solid is reduced to an impalpable powder.



"YANKEE FARMER." FLOYD VAIL, F. R. P. S.



"RUSSIAN IMMIGRANT." FLOYD VAIL, F. R. P. S.

A solid piece of iron will resist for years oxidation ; but iron in the shape of filings degenerates quickly into iron rust.

Now chemists know how to get iron in so fine a state of division, infinitely finer than any mechanical process can affect, that the infinitesimal particles ignite in the atmosphere spontaneously by combining with its oxygen.

Silver, we are told, is in a more or less finely divided state in the sensitive film, and thus in a favorable condition to respond to extraneous influences.

Furthermore, silver, we have reason to believe, may exist like phosphorous and other chemical bodies in several allotropic states. This, of itself, might explain why one kind of silver may yield a less permanent image than another form ; that is, less resistant to hostile chemical action.

The silver precipitated by development in the image of a bromide print like that formed on developed, exposed plate is there in quite a different condition, the silver forming the image in a printed out photograph. If we examine microscopically the image formed on a plate or on bromide paper we notice that it is composed of a multitude of closely aggregated little particles of a measurable size ; but if we subject a printed out image to the same magnification there is no granularity perceptible. The silver is in such a fine state of division that the surface looks homogeneous. Now the reasonable conclusion is that the character of the two images is constitutionally different, the silver in each particular case being in an individual allotropic condition.

If the form of the silver were identical in both, then the simple process of fixation ought to render a printed out picture as permanent as a developed one--which is not the case, as you know. Even toning, with an unalterable gold, does not insure permanency like that of a bromide print.

The fine state of division of the silver in the printed out image subjects it to the action of agents contributing to the deterioration. Even too prolonged washing tends to weaken or fade the printed out photograph.

The tendency to fading out of the image attendant upon the method of combined toning and fixation is generally attributed to sulphurization or the conversion of the image into silver sulphide.

This is not exactly true, because silver sulphide itself is not a particularly unstable compound, rather the contrary, and besides the sulphur toned bromide (sepia) seems to be quite permanent when properly proceeded with.

What is more like the cause of disparity in the two examples is due to this allotropic condition, the one, the bromide, permitting the formation of a complete silver sulphide, the other, the printed out picture, forming an organic sulphide compound or compounds apt to change on account of unstableness?

It is sometimes affirmed that the collodion (P. O. P.) is less liable to fade than the gelatine printing out paper, because gelatine is considered a less stable product than nitro cellulose. But gelatine on the plate and on the bromide print would tend to refute this. Gelatine collodion and albumen have given proof that quite permanent prints may be had where they form the vehicle for the sensitive body, and it is reasonable to look to other presentations to discover the agents of fading.

MISTAKES OF VIEWPOINT—WM. S. DAVIS

YOU naturally move about when possible to view a subject from different angles before making an exposure, but do you always stop to think what a difference it often makes regarding the *height* and *distance* from which an object is seen?

In photographing figures and animals, especially, these two points have much to do with the result—whether satisfactory or the reverse.

Too low a viewpoint always exaggerates the apparent height of the subject, while a very high one dwarfs its size; and too near a point of view also gives violent foreshortening of any object showing lines of perspective. These results have nothing to do with the quality of the lens used, as they simply represent the actual effect of the lines of the subject seen from such viewpoints. Peculiar viewpoints, however, by altering the aspect of familiar objects, make them appear abnormal in a picture.

In the case of a large object, such as a big building, or such a scene as a mountain, a difference in height of several feet would not alter the general aspect of the subject to the observer, owing to its distance from the eye, but the matter is different when the object of interest is smaller and quite near the lens.

The foreground details in a landscape, such as bushes and grasses, can be made considerably more prominent by working from a low viewpoint, as they then appear taller in proportion to the lines of the distance, but unless there is something of special interest near the camera which will be improved by such treatment, it would be advisable to keep the camera higher from the ground, as

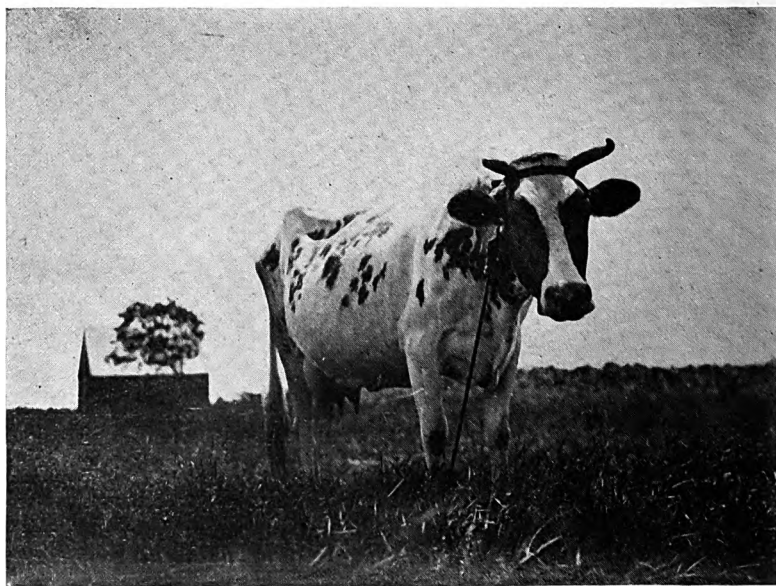


FIG. 1

a low position in an open scene showing an expanse of flat land will cause the details in receding planes of the subject to overlap one another to such an extent that the relative position of foreground, middle-distance and distance will not be properly differentiated. On the other hand, unless one is trying to get a down-hill effect, too high a point of view is also to be avoided; for looking down upon an expanse of level ground, or water, with the resulting high sky-line, gives the feeling that the surface is tilted upward.

A very near standpoint in proportion to the size of the subject necessarily gives an appearance of exaggeration in size of the nearest parts.

Mistakes of viewpoint are likely to be most noticeable when the subject is a figure or animal, since in the case of an object whose size and shape is known to the observer, any error in the apparent scale of rendering immediately attracts unfavorable attention.

As examples of what we mean, consider the accompanying cattle studies, all taken with the same lens. Fig. 1 is a glaring example of *too low* and *too near* a viewpoint, the lens being only ten feet from the cow's head, and about two feet from the ground. This low viewpoint lowered the skyline excessively, making the pasture appear very flat and at the same time caused the image of the cow to tower up to double the height of the distant building in the picture; an effect which would have been a great exaggeration in picturing an elephant, let alone a moderate-sized cow! As though this was not bad enough, however, look at the foreshortening of the animal, comparing the size of the head with the hindquarters. True, this is a rather extreme example, I'll admit, for, as a matter of fact, the photograph was deliberately taken to emphasize these points, but many less striking snapshots of similar character are constantly being made

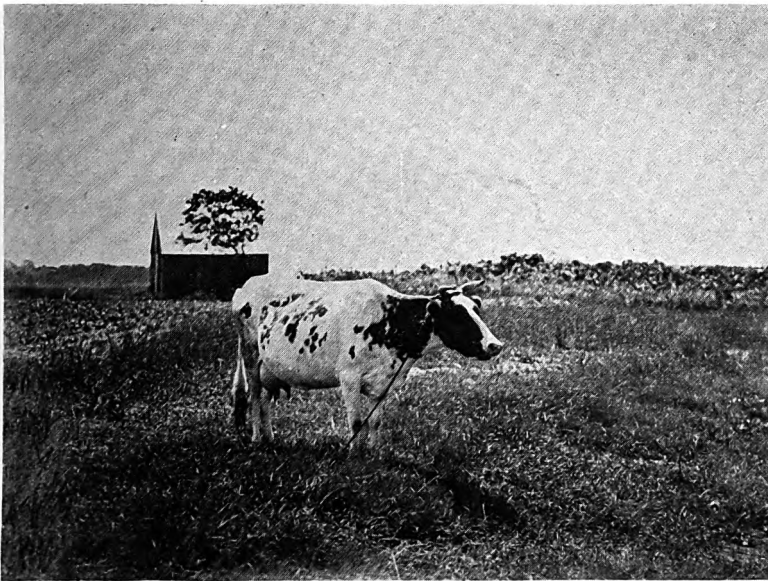


FIG. 2

unintentionally. Fig. 2 shows the difference in perspective and proportions produced by removing the camera to a distance of twenty-five feet from the subject, and holding it at near eye level. Not only are the lines of the cow rendered in a normal manner, but its relation in size to the landscape is more truthfully expressed. The height of the nearly level skyline marking the end of the field is, however, a little too much on a line with the cow's back to be quite pleasing—in other words, this study goes a bit further in the opposite direction from Fig. 1 than is really necessary. In this respect Fig. 3 shows a "happy medium," a cow of similar size as the one appearing in the other two examples being taken a little nearer the lens, and from a few inches lower viewpoint than in Fig. 2, which brings the back of the animal sufficiently above the line marking the edge of the pasture to give an agreeable and normal result.

Generally speaking, a viewpoint about the height of the animal's nose give a good effect in the case of horses or cattle. Sheep, however, being so much smaller, would naturally be seen, as a rule, from a somewhat higher position than their own height, and the same is true of a dog, though, in taking a picture at fairly close range of a dog or cat, it will be necessary to keep the lens about on a level with the eyes of the subject to avoid the appearance of distortion; for a higher position shows too much of the top of the head and exaggerates its size, while a lower viewpoint magnifies the apparent size of the animal's body.

In photographing a standing figure full length, the height of the camera is more important than its distance, since there is so little depth or relative difference in separation between the near and distant portions of the figure, that this matter will take care of itself, but the height from which the subject is

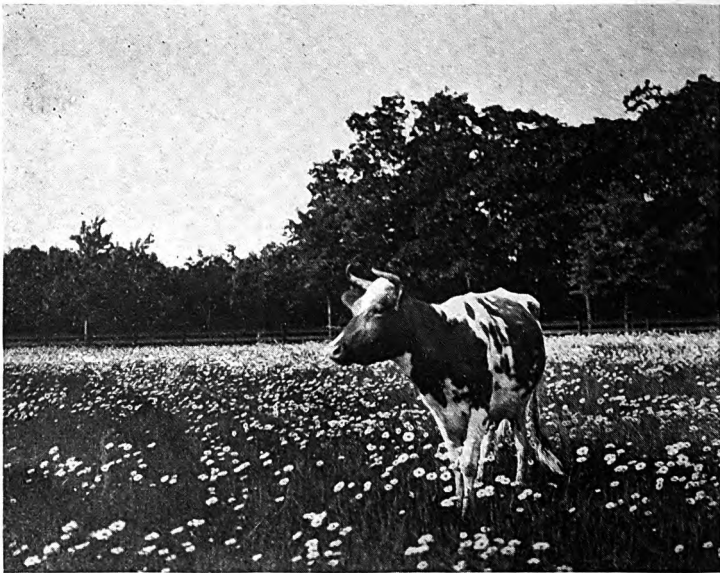
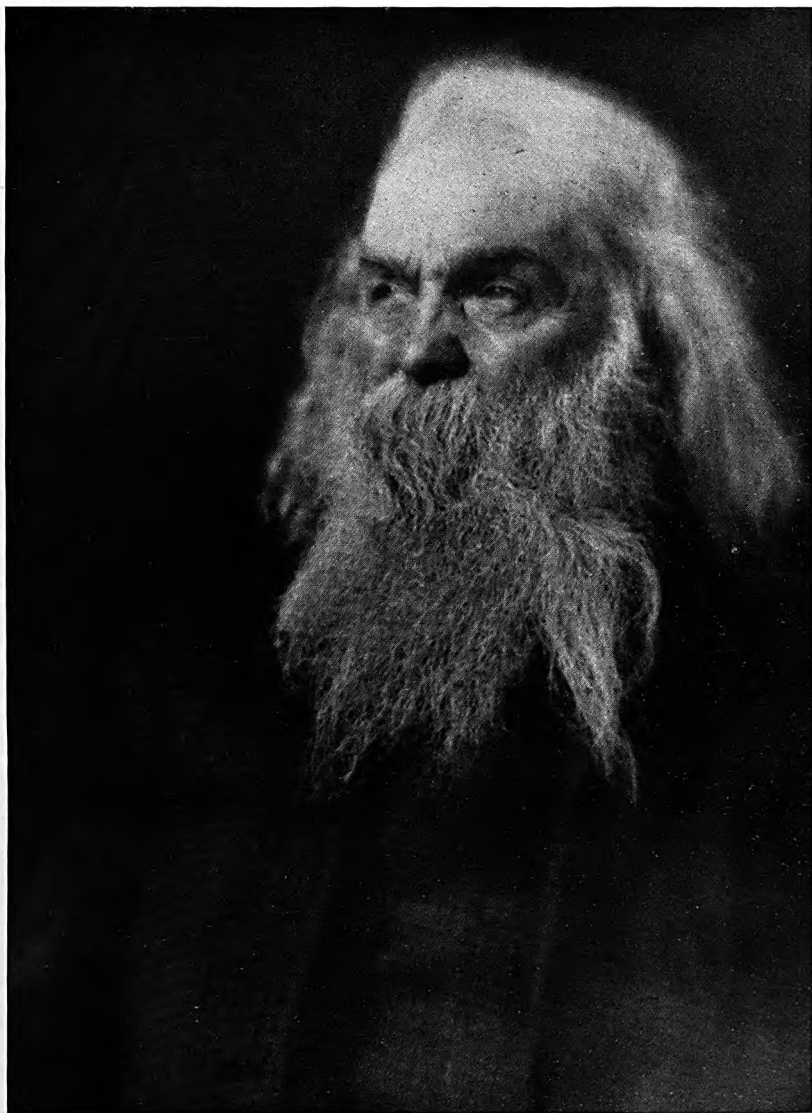
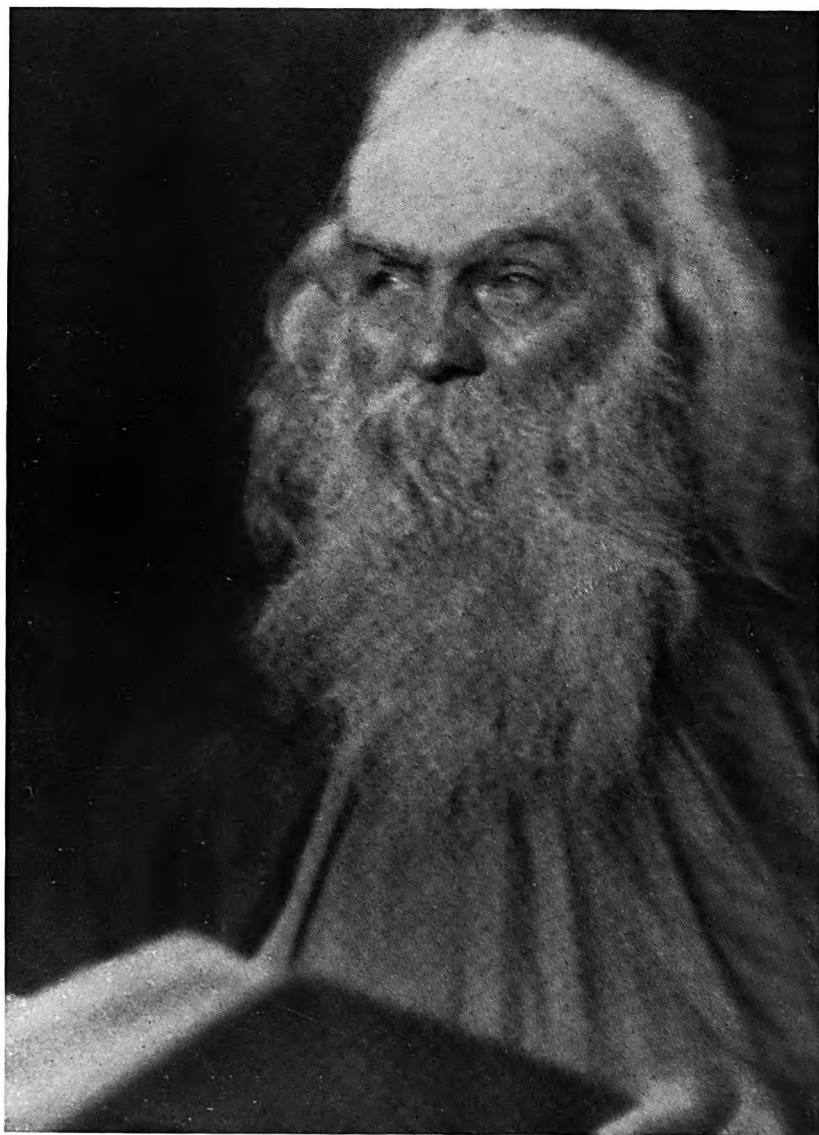


FIG. 3



"HALE AND HEARTY." FLOYD VAIL, F. R. P. S.



"LAW AND THE PROPHET." FLOYD VAIL, F. R. P. S.

seen determines the apparent height of the latter in the picture, just as it did in the animal studies used as examples.

The height of viewpoint has a still more marked effect upon the result in a study of head and shoulders only; for the camera being brought much nearer to secure the larger image wanted, a few inches difference in its height changes the appearance of the head very much, particularly in a front or three-quarter view. A low position of the lens emphasizes the size of the chin and shows too much of the nostrils, besides increasing the size of the shoulders disproportionately to that of the head. A high viewpoint, on the contrary, shows the top of the head at the expense of more important parts, including the eyes.

In a seated figure, front view, too low a position of the lens, or a very close standpoint, is bad, as the feet and legs are rendered disproportionately large compared with the body and head.

It is always well, in order to be on the safe side, when taking a standing animal full or three-quarter front view, or a seated figure in a similar position, to keep the camera at least four times the distance from the nearest part of the subject as the nearest and most distant portions of the subject are separated from one another. For example, if an animal is standing in such a position that the nose is, let us say, five feet nearer the observer than the tail, place the camera at least twenty feet from the head. The perspective will then be easy and natural, if the height of the lens is kept near that mentioned previously for various subjects. Perhaps when following such a rule the image of the principal object will not always be as large as desired, but that can be enlarged to suit, whereas it is impossible to change relative proportions of the image of an object once the negative is taken.

THE BIRTH OF THE CINEMA

UNDER this title Ernest Coustet presents, in the March issues of *Le Photographe*, an outline of the history of the motion picture. With all great investigations and discoveries, it is very difficult to fix the earliest point in the development. Searches in such fields will generally lead to appreciation of Sydney Smith's remark about "those confounded ancients who anticipated everybody." Jenkins, in his book on "Animated Pictures," claims that Lucretius, a Roman writer of the first century of the present era, alludes to them, but his translation seems a little too free. Coustet gives credit to Roger Bacon for having enunciated the general principle upon which projection apparatus depends, but the application of the principle of persistence of vision, which is the physiologic basis of the motion picture, is much earlier than Bacon's time. The first pictures, however, were merely silhouettes, and could be viewed by only one, or, at most, very few persons at one time. The projection apparatus in the form called the "magic lantern" was described by Kircher in a book published in Rome in 1645.

The illusion of continuous motion is produced only by pictures succeeding one another at the rate of at least ten per second. The Belgian physicist, Plateau,

first determined the duration of the retinal impression, commonly termed "persistence of vision." He also examined the conditions necessary to the reproduction of movement, and in 1833 constructed an apparatus that he called the *phenakistiscope*, the name being derived from two Greek words, meaning substantially "to deceive the sight." It consisted essentially of a disc of cardboard, pierced with about a dozen openings, and bearing, on the other side, a series of designs, representing periods of a given movement. The disc held before a mirror and rapidly rotated gave, when the pictures were viewed through the openings, the impression of motion. Many modifications were made of this apparatus. Horner constructed a cylinder, with vertical slots, and placed within a band of paper containing the pictures, which were then viewed through the slots while the cylinder was in rapid motion. This form of apparatus, under the name "zootrope," or "zoetrope," was a familiar scientific toy in the middle of the last century. A crude form illustrating the same principle, the "bird in the cage," dates much further back as a child's toy.

All these forms of apparatus had the disadvantage that they represented merely a few movements. For the exhibition of real motion pictures; that is, pictures obtained by photographing the objects themselves, turn to the United States, although Coustet is seemingly not aware of this phase of the history. In 1861, Coleman Sellers, of Philadelphia, took out a patent (U. S. No. 31,357) in which the pictures were on an endless band. Jenkins regards this as the first ever made in a camera so as to give the appearance of objects in motion. In 1869, a patent was granted to A. B. Brown for a lantern adaptation of the zoetrope. The pictures were, however, not photographs, but drawings.

In 1870, Henry R. Heyl exhibited at the Academy of Music in Philadelphia, in the course of a lecture given under the auspices of the Franklin Institute, several scenes projected on a screen, using photographs a little over one inch, taken directly from the moving objects. These motions were of a pair of waltzers and some acrobatic performances. The waltzing scene was shown to the accompaniment of appropriate music by an orchestra.

A material improvement in the technic was made by Muybridge, who in 1872 began a series of experiments in California and afterwards continued them at the University of Pennsylvania in Philadelphia. He used a battery of cameras, with wires controlling the shutters, so placed that the moving object would cut these wires in succession, and thus produce a picture on each plate as it passed. Muybridge's plates covered a large field of investigation; the photogravures from them were made into a book, copies of which are in many of the larger libraries. His results showed that many of the conventional methods of representing animals in motion were quite incorrect, but modern progress in rapid photography has made every one familiar with these peculiarities. Muybridge worked for about four years at the University of Pennsylvania, and among other things constructed an apparatus of very large size, in which glass positives from his pictures could be shown on a screen reproducing the motion. In 1888, he had an interview with the distinguished American, whom Mr. Jenkins calls the "great improver of inventions," Mr. Edison.

An English patent had been taken out in 1878 by Donisthrope for an apparatus in which a succession of glass plates was made to appear in view rapidly, and reference was made to the use of a paper strip applied somewhat in the zoetrope style. He made further suggestions in 1878.

Coustet resumes the story at this point, taking up the work of Marey, who had met Muybridge in 1881 in Paris. Marey has also been working at an apparatus suggested by Jannsen, the astronomer, whose name is so intimately connected with the discovery of helium. In 1891 he presented to the French Academy pictures of the flight of an insect silhouetted against the solar disc. It was stated that the exposure was only about the 1-20,000th of a second. Demeny, an assistant to Marey, made some further improvements. Reynaud, in Paris, made pictures by hand on a flexible transparent ribbon, which he exhibited in his "optical theatre." Jenkins ("Animated Pictures") thinks that the nearest approach that was made about this to the present day methods was by Augustus Le Prince of New York in his patent, granted in 1886, No. 217,809. He employed perforated strips of considerable length, made of gelatin, horn or mica. The pictures were made by passing the sensitive film behind a battery of sixteen lenses, arranged in four rows.

The perfection of a complicated method usually involves development from several independent points of view, and the modern motion picture is a good illustration of this fact. Before the representation of actual motion could be made satisfactory, it was necessary to have a tough, flexible transparent film, a highly sensitive emulsion of good keeping qualities, rapid lenses, steady, quick-moving machinery and a light of high power. Celluloid met the first requirement, the bromide emulsion the second, mathematical research the third, mechanical ingenuity the fourth and the arc light the fifth.

The development of the modern motion picture industry and the "movie" theatre are in the main familiar to all. The names of Jenkins, Edison and the Lumière brothers are especially prominent in the field, but many workers have given to the subject the benefit of their ingenuity and application.

THE SCIENTIFIC BASIS OF MOUNTING

THE painter is never indifferent as to the style and character of the isolating medium differentiating his picture from the background of the wall upon which it is hung. This consideration is as important as proper regard for the way by which it is illuminated.

To the pictorial photographer, the subject should be of like consideration, inasmuch as the character of his picture is conditioned by its setting; that is, the card mount upon which it is placed either enhances its artistic merit or detracts therefrom, even to the extent of doing positive injury to it.

In former days the color range of prints was limited to shades of black, brown and purple, and the mounts employed restricted to white or India tint. After a time some one introduced a variety of tints—which were indifferently adapted to all sorts and conditions of prints—till "motley was the wear."

A revulsion of feeling took place just about the time the æsthetic wave swept over photography, but in the endeavor to return to saner methods, the funereal black or dark grey usurped the field, and every sort of print was consigned to its tender mercy, which, like that of the wicked, was often cruel.

Unfortunately the pictorialist takes but little if any consideration whether the mount he elects has influence or not upon the general tone of the picture upon it.

The subject of mounting ought to be based on some constant principle, and not be left to individual fancy.

To mount artistically, it is necessary to study the value of simultaneous contrasts and color harmony, so it may be possible to reduce "mounting" to some scientific basis.

The changes which are produced in colors by contrast have reference to brightness as well as fullness and hue.

In photography the simultaneous contrasts dare not be disregarded. Most of us are familiar with the experiment of placing a disc of white upon a black ground and then after gazing intently for a little time at the disc transferring our glance to another sheet, but this time of a grey instead of white, we see upon this latter ground, a darkened image of the original white disc.

If we use instead of the white disc, a colored one, look at it as before, and then gaze again at the grey sheet, we find that the after image is of a color complimentary to the original disc. If red, for instance, the after image appears bluish-green, if yellow, it is decidedly blue.

If, after having fixed our eye upon an object for an appreciable time, we then look upon a surface identical in color with this object, the after image appears fainter in color than the original, but if the surface gazed at is of a color complimentary to the color of the original object, the after image will appear deeper and more brilliant than the surface upon which it shows up.

To try this, fix the eyes upon a bluish-green disc, for instance, and then quickly turn and look at some bright red surface, and you will see an intense red disc on a duller red background.

The physiological law governing this phenomenon is well known, and we merely quote it here to show its application to mounting; for the changes which color undergoes when placed in juxtaposition, are amongst the means for securing pictorial effect.

The contrast between light and dark being the simplest case, let us take it up first, as of most consideration to the photographer.

If we place a given hue, a medium grey, for instance, such a tone as we get with platinum, bromide or developable paper, upon two different sheets of paper, one lighter in tint, the other darker than the superimposed grey piece, there is presented a marked difference in the tint of the superimposed piece.

On the ground which is lighter, the piece looks darker than when it is viewed on the other darker ground.

If we cut two discs of medium size from the same sheet of paper and lay one of them upon a ground lighter, the other on a ground darker, it seems



"THE PATRIARCH." FLOYD VAIL, F. R. P. S.

incredible that the two little discs are identical in color and cut from the same uniform large sheet of paper; but you see that they are identical merely by removing one of them from its support and placing it alongside its twin.

The most remarkable fact to be observed is this, that the disc, the brightness of which exceeds that of the ground only by a slight degree, looks almost as bright as that upon the ground which is of a grey, almost black, while in the same manner a disc upon a ground only slightly brighter, looks almost as dark as the one on a grey almost white.

It is evident from this that the small discs suffer a change of brightness by contrast with the ground, and that the smallest perceivable difference in brightness between the two surfaces produces almost the same effect of contrast as that produced by the greatest which can be conceived.

This "effectiveness of small differences" is of much importance in the determination of the character of the mount for the print.

We have frequently watched the photographer mounting his picture and heard him assert that the flat boundary of the picture must be several degrees lower in tone than the middle lights of his photograph; but when asked why, he was at loss for a reason.

Our judgment in regard to similarity or dissimilarity in brightness becomes all the more certain the nearer the two surfaces to be compared are placed to each other, and the greatest degree of certainty is reached when the two surfaces touch directly (in juxtaposition).

When the two surfaces are placed in actual contact they look as if they shaded off gradually towards each other, although we know that both are uniform in tone.

Furthermore, the brighter surface appears to increase in brightness, the darker one in darkness towards the boundary line; so you see that the effect is most decided at this line.

We all know about inserts used in mounting, that narrow margin directly surrounding the print and somewhat different in tone from the mount itself.

You think this is for decorative effect, but it plays a more important rôle in mounting scheme. Sometimes the photographer's intuition leads him to choose the proper insert and then he finds how his work has been enriched; but he has to go through the same trial system of selection and rejection till he strikes it right.

The employment of this insert is done upon no constant principle, and the photographer has no other resource than method of substitution. The principle involved is what we were just speaking about, the phenomenon presented by juxtaposition of color. The one tint is affected by that contiguous.

Surfaces of different colors placed in juxtaposition show phenomena which are analogous to those resulting from association of surfaces of different degrees of brightness.

One color is likewise changed by another adjoining it, so that in reality the difference seems greater than it is.

There is one peculiarity about this color contrast which seems unexpected.

Colors of a lower degree of fullness; that is to say, pale colors, inclining towards dark shades exhibit this phenomenon of contrast more decidedly than do full colors.

Full colors force their hue so powerfully upon the eye that no room is left for the illusion of the judgment.

Now it is well known the photographic mounts are seldom full in color, but in pale neutral tints, and it is found that the effect is not so pronounced unless there is a mixture of white in the hues contrasted.

If we place a piece of black paper upon a positive colored ground we get only a faint tinge of the contrast color upon the black surface, especially if the surface is matt, without lustre. But if we subdue the full tone by placing over it a sheet of thin tissue paper—the contrasting color at once gets more decided.

Cold colors induce the appearance of contrasting colors of greater intensity upon a neutral grey surface when that surface is lighter. Warm colors induce it when it is darker than the inducing color.

Hence, those colors which are naturally dark must produce contrasting colors which are much brighter than those produced by bright colors.

Cold colors, therefore, produce simultaneous contrast upon neutral ground better than do warm colors. All these principles are applicable in methods of mounting photographs.

The colors of modern prints are considerably more varied than photographic print a score of years back, and the doctrine of effect by simultaneous contrast ought to be a valuable aid in selection of appropriate mounting method.

FIELD OF PHOTOGRAPHIC DISCOVERY

THE time in which we live is so often spoken of as an era of “scientific miracles,” an age of mechanical marvels, for so surprising are some of the discoveries and inventions which have signaled the last half-century, that if they could have been foreshown, even in the bare results, to those great inaugurators of scientific method of the seventeenth century—Bacon, Newton, Descartes, Pascal *et al.*—such a report would have seemed—to them, sanguine as they were in the belief of the future for science, to indicate the arrival of almost a supernatural dispensation, that these supermen of the coming age were to be masters of the powers of magic who might compel the spirits of another sphere to do the drudgery of this world.

In the strictest sense of the word a mere report of some of these discoveries, and of what has been accomplished by means of them would even to the most intelligent listeners of the eighteenth century, have seemed occult, far surpassing the limits of reason.

But it does not concern us here with the narration of such discoveries, such as the means of actually speaking over long distance without any visible signs of communication further than a wire, or of aerial navigation or the reproduction of speech by phonograph—facts of this nature having become so familiar as to be commonplace.

Modern inventions and modern advancements touching almost everyone of the arts of life—mechanical and chemical—have given a mighty impulse to our social system at large, as well as a new direction to several lines of human industry, the ultimate consequences of which are still veiled by an awful uncertainty, so that we can hardly refrain from putting the question, "What shall the end of this be?" "Can we possibly go further?" Dare we deny the possibility of communication with distant worlds?

It was Sir Humphrey Davy, we think, who said science would never be able to demonstrate the chemical constitution of the sun and stars. Yet he was a philosopher of fine imagination, and had he lived a few years longer would have seen some of the very elements he had discovered, as constituents of the sun's atmosphere.

In no other branch of physics have more marvelous discoveries been made than in light.

The discovery of photography itself is marvel enough, to say nothing of the phenomena of radiant energy just dawning upon us. Can anyone predict what it may yet reveal?

But we must not further dilate on these marvels, but come to what we set out to talk about, to notice a circumstance connected with these inventors and discoverers, which, though largely significant, has been but little regarded as a collective fact or as indicative of a principle.

The recurrent fact is this: that almost everyone of the signally marvelous discoveries has been the offspring of minds untrained in the professions, undisciplined, uninstructed, or to put it simply—by mere "laymen."

Not for an instant that we wish to assert that knowledge and discipline are obstructive, or that systematic education should be dispensed with, or that discoveries are mere lucky chances. No such inferences are warrantable, but it may be said that, unschooled genius, as distinguished from trammelled and over-trained intelligence of the professional, has revealed to the world most of these new and almost irrational ideas.

Confining attention to our own province of photography, as confirmatory of the above assertion, we cannot recall a single discovery of radical advance in the art which can be credited to a professional photographer.

The very inception of the art is due to an itinerant showman, whose purpose primarily was to improve panoramic exhibitions. The perfection of photography all along the line, looks as if traceable more to accident than as the result of patient investigation, because most of the experimenters pursued methods which the trained workers might smile at.

It would seem, therefore, that there is some danger of trammeling up the movement to discovery by harnessing with conditions, even though these conditions may be valuable means to scientific culture and essential to training.

When the outbursts of unschooled genius are placed by the side of the canonical procedures of the professional mind, it will be seen that they are less under the influence of what might be called the guild system of training.

The individual man within the profession strives along the lines laid out

for his guidance, and achieves distinction by his success in some particular instance by making more perfect and practicable what was less elaborate by putting a higher finish or giving a wider scope and application to some established or conventional achievement, but the "erratic" genius, as he is called, reared outside the professional pale, does what he does, as if it were an intended outrage upon all that is authentic, and in effecting his purpose excites a host of those wedded to cherished beliefs.

The line of recent investigation in color photography has been kept exclusively to the direction of certain scientific principles, time honored and respected, because established by such intellects as Clerk Maxwell and Helmholtz. Marvelous results have been achieved, but may we venture to suggest, in the cause of our contention, that it may not be wise for those who are interested in direct color photography and who do not look upon what has been accomplished as the real solution of the problem, to let their investigation be trammelled by conditions or assumptions, however great the endorsement.

The unexpected is always likely to happen and an apparently trivial occurrence may be the guide to the much wished for discovery.

THE INFLUENCE OF THE COLOR OF WATER IN LANDSCAPES

IN many a photograph where water forms the initial part of the subject, especially if it is shown in a large mass, there is much more show of color than the casual observer thinks. The general notion prevails that water is colorless, but water is only colorless when looked through; that is, when seen by transmitted light.

Water in nature often shows magnificent play of color by reflection, but the photographer, presuming on the natural physical character, lack of color, *per se.*, often fails to reproduce the natural effect of a broad sheet of water, and so falsifies the landscape in the reproduction in monochrome.

The effect is always over-intensified, and a consequent misrepresentation so unlike what the skilled painter gives.

Independent of the reflection of the high colors of the landscape by the surface of the water, it needs only ordinary observation to be convinced of the fact that large masses of pure water show an initial blue or green color also. The mere circumstance that the reflection of the sky on the water's surface exerts a material influence on the phenomenon presented by the mirror-like action of the water has given rise to a widespread but erroneous explanation of it.

It is taken too much for granted that the cause of the peculiar color presented by the water must be attributed to reflection only. But it may be demonstrated that water, in mass, presents a color of its own, produced by absorption of light.

Bunsen, the celebrated chemist, was the first to prove decisively that water is not colorless. He showed that a white surface appears of a pale blue color

when looked at through a tube, two metres in length, closed with plates of clear glass fixed at both ends, and filled with distilled water.

In this respect the water is similar to window glass, which also exhibits a blue-green tint when it is of sufficient thickness.

It follows, therefore, that where there is the necessary thickness of the body of water the eye sees that part of the reflected image, seen through the mass of water in the color, or supplemented by that color, which is peculiar to the water itself.

If the water is pure, as in Alpine lakes or other glacier deposits, the color presented is of the characteristic pure blue, such lakes invariably present. But if the water holds more or less organic matter in suspension, as is the case with bodies of water in a general landscape, the color changes to green, and in swampy water to brown.

So the reflection had from the surface of water is of material consideration, if account is to be taken of correct rendition of color value in terms of monochrome.

When the surface of the water, however, is very placid, like "Mirror Lake" in the Yosemite, the reflection may assert itself to such a degree that the water acts just as a mirror, and only a minimum of effect is produced from below.

In shallow water, on the other hand, where there is a light-colored bottom, the transmission of light from the underpart has marked effect upon the color of the image, and unless the water is very deep, the transmission from below has most decided ascendancy over the light reflected.

This may be particularly noticed on the shores of lakes, and ought to be always taken into account by the photographer who is after a natural effect.

According to the relative position of the sun, the surface of the water, and the point of light of the observer, the light of the sky may be reflected either completely or only partially. Where the reflection is, in the minimum, almost imperceptible, the true color of the water asserts itself, and may show up intensely blue, even on days when the sky shows very faint, hazy hues.

This is particularly noticeable when the observer, whose face is turned towards the water, has the sun at his side. When, on the contrary, if the sun be before or behind the observer, the reflected image of the sky is seen in its true value of color, and the water itself is not so deeply colored.

Hence the necessity of observation of the character of the water to judge of the actinic action upon the sensitive film, and the danger of underestimating the actinic intensity. Clouds reflect the light irregularly, and present no obstruction upon a placid surface of water, and so when there is overcast, uniform sky, there is considerable modification in color intensity.

The disregard of these phenomenon presented by water, is the primary cause why water in landscape subjects by the camera comes out the most defective part in the picture.

The photographer should carefully consider the color tones and determine the kind of plate and the nature of the ray filter to best express in black and white the values of the scene.

SOME MINOR USES OF DRAPERY

IT must be admitted that the painter has considerable advantage over the photographer who endeavors to conform to the cult of art, in having more under control the disposition of the drapery in posing the subject.

One source of trouble which operates much against securing effect in our portrait pictures is our difficulty encountered in arranging the costumes, that we may get the upper portion of the figure relieved, light off dark, and the lower dark against light, and *vice versa*.

Nothing truly is more destructive of agreeable presentation in a picture, or gives so dry and stiff an appearance, as to see principal objects relieved from top to bottom, dark against an evenly light background, or light against a correspondingly dark ground.

Why this unpleasantness is not so easily explained; but the truth is, we have only to compare a photograph of a person, posed at full length, or even half-length, in dark garments against a light ground, with one in which the costume or background have been so varied as to make less perceptible relief, to see how hard the former seems as compared with the latter, in which some artistic skill has been used to get variation.

Men are constantly presenting themselves in light or dark suits from head to foot, and ladies in dresses occasionally of velvet, and white silk or satin. One of the most trying subjects is the bride in her wedding gown.

Now, what is to be done? The only thing seems to be to lose either the upper or lower portions (perhaps the latter is the preferable course) in the background.

By this artistic dodge, and the employment of a background that will not give too great contrast, we may do much toward overcoming the objectionable quality of equal relief and consequent stiffness. In varying the depth of the background, however, we must take care not to let the change from light to dark be too sudden, thus bringing the opposing shades together so as to form an abrupt termination and give rise to an objectionable line up and down the picture or across it.

As with the best painted backgrounds, the light portion should meet into the dark, and diagonally instead of horizontally, making the greatest variation of tint at the upper and lower right and left-hand corners, instead of equally across the top and bottom of the background.

Where there is no special background used, drapery may be substituted, but it must be made to dispose itself and be so lighted as to get rid of the monotony of equal relief. Curtains and hangings are so much the rule in apartments that they always appear appropriate in a portrait, and especially adapt themselves to the special case under consideration.

The look of finish, harmony and elegance all contribute to the general effect of completeness. Many a time one can get rid of a nasty angularity in a chair by throwing, in a sort of artistic, careless way, a soft light shawl and other suitable drapery over a part of it.

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Duration of the Latent Image

All the theories hitherto advanced as to the nature of the latent image, formed by the action of light on the responsive sensitive film, are not convincing, but the investigations have presented facts which tend to the conclusion that the change produced is of a physical character, that the impact of the light sets up a molecular disturbance and dissociation is effected, and a new condition of equilibrium of the particles produced.

The phenomenon is akin to what takes place in phosphorescent bodies; that is, eventually the impulse dies down, and the film of silver emulsion, like the phosphorizing body, returns to the normal state it had before illumination. This phenomenon would tend, therefore, to support the view of the ultimate fading of the latent image. But investigators, notably LeBon, have shown that more than eighteen months after exposure a gelatine plate may be made responsive to stimulation; that is, the excited molecules may be lashed up, as it were, from their tardiness and show that they are only quiescent, not extinct.

In the collodion process, where the image is superficial in contradistinction to the image in gelatine matrix, disappearance of the impression takes place in comparatively short time after exposure of the plate, so that there is a limit to interval of its development, but with gelatine films it cannot be asserted positively that the latent image is effaced by time. LeBon's experiments would seem to substantiate the possibility at least that even a momentary impulse of light persists for a considerable period of

time. The ultimate fading may be attributable to the impossibility of preserving the integrity of the original impact from extraneous or associate film-influence militating against its continuance.

The experience which has been reported relative to development of exposures made six months or more previously has been that the character of the image evolved by development, as compared with that upon freshly exposed plates of the same emulsion handled in the identical way, is in the direction of softer negatives of less contrast, than films developed a few hours after exposure.

We cannot positively say, therefore, that the latent image ultimately disappears, but neither can we affirm that it is not impossible by action of some force to call again to energetic action the retarded dissociation.

Time may have some effect upon the gelatine lock-up of the molecules. Gelatine perforce must get harder and more horny by influence of age; and some means might be devised to unlock the prison and give the cellmate freedom to act once more—to the kind impulse of extraneous assistance.

Anticipation of the Diffusion Lens

The name of Mr. A. Claudet is known today only to a few photographers who are interested more in the history of the art than in its artistic advance, yet nearly half a century elapsed before the plan he devised for securing diffusion of focus in the lens was made practicable and a lens constructed on his principles put upon the market. As early as 1866 Mr. Claudet described a portrait combination consisting of three achromatic lenses, the middle one being so arranged that it could be racked either to or fro between the front and back lens, or be made to keep continuously in movement by a reciprocating mechanism.

In using the three lens combination sharpness of focus could be obtained, if desired, by adjusting the whole system and fixing the same—the equalization of the focus of the different planes—during exposure being obtained by the advance and recession of the inner lens.

The combination being at a fixed point of distance from the plate, there was only a minimum amount of enlargement of image when movement was made of the whole system.

It is remarkable that Mr. Claudet saw the pictorial advantage of diffusion at a time

when absolute sharpness of image was the *sine qua non* with his contemporaries.

In his address to the British Association, at Nottingham, in 1866, he remarked that excessive definition is the principal reproach the painters make against photography in its artistic claims.

Claudet sees clearly that the making of photographic portraits after the manner of Mrs. Cameron, a little out of focus, was not the solution of the problem because the advocates of this method forget that such a way fails to give the true artistic diffusion of image. There would always be one plane too distinct in relation to the others and softness of other planes would result in mere blurring and distortion.

Claudet was convinced of the advantage in an artistic way of a controlled diffusion and his invention had the object of furnishing a means for removing from photographic practice the mechanical impediment to softness which militated against its artistic accomplishment.

The advantage claimed by the diffusion lens of his day is made more emphatic by the triumph of mechanical ingenuity in the modern soft focus lenses.

Latitude in Exposure

There is considerable misconception prevalent about what is called latitude of exposure of gelatine plates. It is a popular notion that a slow plate has greater latitude of exposure than a rapid one, but this idea has no foundation whatever. A thickly coated plate will not allow the photographer to vary exposures from one to four seconds and give equally good results. Neither will a thinly coated plate, one in which the emulsion has a smaller amount of silver to the gelatine, give good results over a wider range than one to two. The supposition of the latitude of exposure may have arisen from the fact that it is not easy to estimate the difference in exposure between fractions of seconds, as in the employment of the very rapid emulsion, whereas in the exposure on the slow plate the difference between whole seconds is more easily accomplished.

The differences in density and general detail secured is pretty much the same on all brands of plates. In order to get the same results, say, with two seconds' exposure, which you would with one second exposure, you must needs modify your developer to accomplish it, and so the so-called supposed

latitude is really the result of modification of the developer to suit the case. It is sometimes contended that distance in the photograph has an effect upon the exposure of objects, and we have heard it recommended to time for the distance, but practically distance has no effect whatever upon objects approximately in focus at the same time. The supposition here has arisen from confounding distance with atmospheric haze. Mist or haze in the air undoubtedly has considerable influence. Let us take a landscape upon a foggy day, and we notice that the landscape seems to dissolve into the sky on account of the supervening fog, even at fifty or a hundred feet away from the camera. And, on the other hand, when the weather is clear, when the atmosphere seems to have been especially swept clean of mist and haze, as frequently happens after the conclusion of a rain, the distant hills stand out clearly defined against the sky, and they require no more exposure than is necessary to secure good impression upon objects in the intermediate foreground.

In making exposures; that is, in estimating the time, the aim should be not to determine the briefest time possible, which shall give possibly good results and have recourse to enforced development, but to give an exposure which shall be competent under treatment with normal (not forced) development. The best plan in making instantaneous exposures is to select the most rapid plate available and as slow a shutter speed as shall be efficient to prevent registration of movement in the subject.

The mistake most amateurs make is in the struggle to set their shutter at its maximum speed and in neglecting to test the speed of their plate. We grant there are some plates on the market of better quality than others, but it is a rare thing to meet with a really defective plate, the bad quality of which may be traced to the manufacturer. Deterioration of films is due to improper storage or to age, and the amateur is not always safe from the dishonesty of the dealer who recommends it as perfectly fresh. The dating of the films by the manufacturer, however, is a safeguard.

On general principles, the most rapid plate is not to be recommended for average photographic work, though essential for snapshots. However, it does not follow that a very slow plate is preferable to a rapid one for landscape. A fairly quick plate, which is not contrary, one which keeps the highlights soft and brings out the detail in the shadows, is the best.—*The Camera*.

Osmotic Tension

When a simple salt, like copper sulphate (blue vitriol), in solution is gently poured into distilled water we notice, by the difference of color, that there is, at first, quite a distinction, but soon we see the molecules of the dissolved salt diffuse themselves through the supervening liquid. This would tend to show that these molecules must have some inherent force which enables them to overcome the mighty force of gravitation, and that this force is called forth by the reciprocal attraction of the particles of the water and the particles of the copper in solution.

Chemists call it osmotic pressure, or tension.

All substances which possess the property of dissolving in a liquid must, therefore, attract the solvent, and conversely be attracted by it. Ordinary lime, for instance, attracts the aqueous vapor of the atmosphere, swells up, and evolves heat to a degree to break the glass vessel in which it is placed.

Osmotic attractions are very energetic. Ten ounces of sugar dissolved in a quart of water exercise a pressure of 22 atmospheres.

This great pressure is not practically apparent upon the walls of the containing vessel, because the solvent opposes resistance to the movement of the molecules. This is fortunate, else you would burst the teacup when you add a spoonful of sugar to the tea.

In order to measure the pressure, the substances present must be separated by a partition (septum), a membrane which prohibits one of them to pass through it.

In a plant this osmotic pressure is very lively in the cellular structure sometimes up to 160 atmospheres. There are always two currents in converse direction, called, respectively, exosmose and endosmose, of which one may overcome the other.

This peculiarity of molecular attraction and repulsion going on in the bosom of liquids lets us have some idea of the wonderful complexity of vital phenomena.

Loeb even, in this way, explains the marvelous behavior of the living germ.

We thus see that in a liquid the existing molecules are able, even at a distance, to attract or repel each other, and it follows, therefore, that the molecules must be surrounded by a field of force, a certain region in which their action becomes manifest. By utilizing the attractions and repulsions of

the free molecules in a liquid, chemists have succeeded in producing variations of crystalline forms, which resemble the forms of living organized bodies.

M. Leduc produced certain mixtures in which were exhibited the phenomena of attraction and repulsion of the particles just like is shown by electricity. By spreading over a piece of glass a solution of potassium nitrate, on which was poured, at two centimeters from each other, two drops of India ink, he formed two poles whose lines of force repelled each other.

To get two poles of contrary sign, whose lines of force attract, a crystal of the potassium nitrate and a drop of defibrinated blood are placed at two centimeters distance in a dilute solution of the solution of potassium nitrate.

The result gave forms resembling those exhibited in low forms of animal and vegetable life. Such are some of the marvels going on in solutions. Yet we never think the thing but ordinary.

The Action of Soluble Iodides on Photographic Plates

THE modern dry plate consists of a sheet of glass bearing a film of gelatine in which are embedded countless minute grains of silver bromide. The silver bromide generally contains a small proportion, ranging from 2 to 10 per cent, of silver iodide, forming with it a homogeneous mixture, or, as it is sometimes called, a "solid solution."

Both salts are remarkable for their extremely small solubility in water, silver bromide requiring nearly ten million times, and silver iodide from 500-1,000 million times its weight of water to dissolve it. Silver iodide would probably be incapable of existence were it not for this extraordinary insolubility; it would spontaneously decompose into silver and iodine when dissolved, for the two elements are very weakly held together. Iodine, however, is an element having well-marked polyvalency, and readily unites with other substances containing iodine, as is shown by the ease with which silver iodide dissolves to form double salts AgI.KI and AgI.2KI in strong solutions of sodium or potassium iodide, and the obstinacy with which it retains these salts or even free iodine when brought into contact with their weak solutions. No amount of washing will remove the last traces.

From these remarks it will be evident why silver bromide when bathed in a solu-

ble iodide is rapidly converted into the far less soluble silver iodide, and why, if the iodide solution be strong, the iodide of silver dissolves in it. 100 c.c. of a 30 per cent solution of potassium iodide will dissolve about 3 grams of silver iodide and stronger solutions a still larger proportion of AgI to KI. Consequently, it is not difficult to fix a dry plate in a potassium or sodium iodide solution of 20 per cent strength.

Apart from its cost, however, such a fixing bath suffers from the serious drawback that it causes softening or even melting of the gelatine film, unless the latter has been well hardened first.

Even in very dilute solutions of soluble iodides the conversion of solid silver bromide to iodide is singularly rapid and complete, provided there is enough solution present. Precipitated silver bromide is completely changed to iodide by excess of a 1:5,000 solution of potassium iodide, while a 1 per cent solution will completely convert the silver bromide in a dry plate to iodide in a few minutes at normal temperatures, provided sufficient solution is used to cover the plate well and it is kept moving.

In a lecture delivered last March before the Liverpool Section of the Society of Chemical Industry ("Journ. Soc. Chem. Ind.," Vol. xxxix, No. 12, p. 156r, and "B.J.," lxvii, pp. 447, 463), I described and demonstrated certain experiments concerning the action of soluble iodides on the latent image. It was shown (1) that it is possible to fix an exposed plate in a strong iodide bath, and, after washing out the salts, to develop an image in silver by means of any of the well-known physical developers; and (2) that it is possible to develop an exposed plate in an alkaline amidol solution after the whole of the silver salts in the plate had been converted into iodide. A suitable bath for this purpose is:

Sodium or potassium iodide. 10 gms.
Cryst. sodium sulphite 20 gms.
Sodium or potassium sulphocyanide 30 gms.
Water up to 1,000 c.c.s.

With the assistance of my colleague, Mr. Olaf Bloch, the influence of numerous salts and other substances in various proportions was tested in order to discover the composition of a bath which would entail the least loss of image by the treatment. Certain hardening and anti-swelling agents, e. g., formaline sodium acetate, etc., were found useful for counteracting the softening action of the sulphocyanide on the gela-

tine. An addition of 1 to 2 per cent. of potassium bromide appeared to preserve the delicate half-tones to some extent, as did also 2 per cent of gum arabic, 10 per cent of alcohol, or the addition of a drop or two of weak silver nitrate, sufficient to yield a faintly turbid solution, but no great improvement on the simple formula given above was found, provided it is used quite cool (55 deg. to 60 deg. F.).

The sulphocyanide has a marked influence on the subsequent developing process, greater density and detail being obtained when it is used. It undoubtedly modifies the physical character of the silver iodide formed in the process, and its effect is probably related to this fact. The chief use of the other additions mentioned seems to be to slow the reaction; slower conversion to iodide invariably led to more complete preservation of the image. One of the interesting features about these iodized plates is that they are so insensitive to light that they can safely be developed in a strong white light without fogging, except when certain developing agents are employed. The most notable of these exceptions is hydroquinone, which has a well-marked sensitizing action on silver iodide, and causes it to fog in a light in which alkaline amidol is a perfectly safe developer. Development of the iodized and well-rinsed plate in an alkaline amidol developer requires a long time to attain completion, but 10 minutes at 65 deg. F. is usually sufficient for a plate which, when used in the ordinary way, would give average density in about four minutes in a normal pyro-soda developer.

The formula we adopted was:

Amidol 20 grs.
Soda carbonate, cryst. 1 oz.
Soda sulphite, cryst. 1 oz.
Water 10 oz.

In the course of these experiments the remarkable fact was discovered that similar quantities of sodium thiosulphate (hypo) could be substituted for the sodium or potassium sulphocyanide in the iodizing bath with at least equally good results, provided the iodized plate was not exposed to white light before development, but that if, while the iodizing solution was still in the film, the plate was exposed to white light, the latent image was to a large extent destroyed. This led me to try the effect of exposing in the camera a plate which had been well exposed to diffused light and then iodized, with the result that it was found possible to obtain direct positives in the

camera by this process, which was also described and shown at Liverpool last March. The reversing action of soluble iodides on latent images on AgI in collodion had been known since the time of Poitevin in 1859, but here we have a latent image, formed originally in silver bromide, then transferred to silver iodide and found capable of destruction by light in the presence of soluble iodides, with the additional interesting fact that the latent image is far more sensitive to light if thiosulphates are also present. The same effect is observable in a plain iodide, or iodide and sulphite, solution to a smaller degree, while sulphocyanides appreciably retard the reversing action.

A recent private communication from Dr. Lüppo-Cramer informs me he has since found that after destruction of the original latent image in this way, it is possible, by further very prolonged or intense exposure, to form a new latent image, a result of considerable interest if not altogether unexpected.

I now come to the most recent outcome of these experiments, and one not hitherto published. Since Lainer's discovery in 1891 of the remarkable effects of minute additions of iodine to alkaline developers, von Hübl, Lüppo-Cramer, and other workers have made a fairly thorough qualitative study of them, both with iodine tincture and alkaline iodides; and Sheppard published a valuable quantitative investigation of the subject so recently as January of last year in our journal ("Phot. Journ.," 1920, p. 12). In that paper he describes and illustrates what he believed to be a fogging effect of very dilute solutions of potassium iodide when applied for a few seconds to the film of an ordinary dry plate. Moreover, he attributes the fog to a nucleus infection of the bromide particles, though of what kind is not very clear.

My observations led me to doubt his explanation, so I repeated his experiments, with the result that I find soluble iodides to have no fogging action whatever, *provided that the plate, both during and after bathing in the weak iodide solution, is not exposed to orange or red light.*

Further experiments soon conclusively proved that the effect of these extremely weak iodide solutions (which may be as dilute as 1 part in 50,000) is to render the plate markedly orange and red-sensitive. This may readily be demonstrated by exposing a treated plate, bathed for 15-60 seconds in 1: 20,000 potassium iodide and

subsequently washed in water, to the spectrum. To assist in locating the regions of the spectrum an exposure on a panchromatic plate was interpolated between those of the untreated and treated ordinary plates, the lines crossing this spectrum being the green and two yellow lines of the mercury arc, the yellow sodium D line and the lithium line in the red.

So far as I know this is the first recorded instance of color-sensitiveness being conferred by bathing a plate in a colorless solution. Naturally, the correct explanation of such a curious effect is much to be desired. For the present I prefer to leave this point without discussing its obviously important bearing on the latent image problem.

A fair number of salts have been tried in the hope of discovering others capable of doing the same thing. So far, only one other has been found—namely, a weak solution of sodium or potassium cyanide. In strengths ranging from 1 part in 2,000 and up to 1: 10,000 the effect is exactly similar in character to that obtained with iodides. It seems clear, however, from the similarity of the effects of two such different classes of salts as iodides and cyanides that the conferred red-sensitiveness must be due to a change within the silver bromide or bromide and iodide grains rather than to anything akin to ordinary sensitizing by dyestuffs.

There is evidently an immense field still open to those photographers who do not possess the advantages of a well-equipped laboratory in the prosecution of such relatively simple experiments as those described in this paper, and I trust that many photographers may be induced to try for themselves to enlarge the boundaries of our knowledge concerning such remarkable phenomena.—F. F. RENWICK, A.C.G.I., F.I.C., in *Journal of the Royal Photographic Society*.

Paper Negatives

A brief notice was given a couple of months ago in this journal of the recent introduction, by two German firms, of paper supports for sensitive emulsions. The motive is the very high cost of glass and celluloid. A recent issue of *Photographische Rundschau* gives a good deal of information as to the practical working of these plates. The writer states that the increased cost of the ordinary supporting materials has been so great as to discourage both amateur

and professional. As noted in the former article in this journal, paper negatives are not new. They were quite familiar to the photographers of the middle of the last century, but they never had the vogue of glass. The celluloid film put the method quite out of business.

The principal disadvantage of paper is its low transparency. The old expedient was to use an oil dressing, and fairly good results were obtained by expert workers. Paper, however, is not homogeneous, as are glass and celluloid, and different fibres may not get the same degree of transparency with a given oiling. This defect may not be serious when large pictures are made, but becomes so when small sizes are used as a basis for enlargements, as is now common practice. Moreover, the oiling of the plate takes a good deal of time, and adds to the cost of the negative.

The properties of the two new forms of paper negatives deserve careful study. The plates are about one-half the cost of ordinary dry-plates on glass and celluloid, and they are far lighter, which is by no means an unimportant item. They are further practically free from halation. Frames are furnished by the manufacturers which are adapted to plate holders, and secure a perfectly flat lay of the paper. The extreme thinness of the film when detached permits of reversing it without danger of losing sharpness, an advantage in pigment printing and other procedures. One of the firms furnishes the plates in the standard film-pack form, which fits in the film-pack holder.

The thin emulsion film, as might be expected, shows some disadvantages. One of these it shares with celluloid base, the tendency to curl. One make of plate rolls up promptly, and requires about two minutes to flatten out. The other make shows less tendency to curl, but still does not flatten at once. It is advisable, therefore, that, before development, all plates should be soaked for a few moments in water. It has not proved to be advantageous to cut the plates (in case smaller areas are desired) before development, as this renders the emulsion film liable to dissolve, though with one make this can be done if great care is used. Most standard developers may be used, but those containing strong caustic alkalis are liable to do harm. Fog is produced only after prolonged development, and is not greater than that which may occur under the same conditions with glass and celluloid. Tank development is inadvisable, as the denser solution at the bot-

tom may act as a solvent. The progress of the development should be watched by looking through the plate, as the direct view seems darker than it really is, and the beginner, especially, is likely to cut development too short. Washing, fixing and final washing are carried out as usual. In order to avoid the curling on drying, it is advisable to fasten the plates down to a board with stick-pins or stretch them between two clamps. If, after drying, the plates are not quite flat, they may be improved by drawing them over the edge of a table.

The removal of the sensitive film is carried out after the above operations are finished. It is advisable, but not absolutely necessary to snip a narrow edge (about one-twentieth of an inch) all around the plate. All that is required when the Bayer "Plattenfort" plate is used, is to raise up with the thumb-nail the edge of the film, whereby, in most cases, it can be easily removed. The film is taken between the thumb and finger, and slowly pulled off. Recent improvements have avoided certain difficulties that were noted in the plates first marketed. The other make, "Mimosa," is treated as follows: By means of a paper-cutter or a very sharp knife, a narrow bevel is cut at one point to the breadth of about one-tenth of an inch, the knife point is then inserted under the emulsion film, which can be then pulled off easily. The Bayer film separates more readily than the other, but has the disadvantage that in long development and washing it is likely to begin to separate spontaneously. Notable changes in temperature of the solution affect the Bayer film more than the Mimosa, causing curling. Any changing of the density of the image that may be deemed necessary should be done before the emulsion is removed from the support, as the film is liable to shrink and even rupture. Retouching with lead pencil is possible with both products. The preservation of the separated film is best secured by placing it between two glass plates. The film may also be immersed in lacquer, and thereby becomes stronger and less liable to be affected by moisture.

Passing from the question of manipulation, the subject of sensibility of the films and their application to ordinary photographic procedures may be considered. Accurate tests could not be made by the writer, as the illuminating material was not at hand. The Bayer plate is furnished in two forms—a matt and a shining surface. The different conditions are marked on the package. The shining surface emulsion is the most rapid

and permits of instantaneous pictures even in dull weather. The Mimosa film shows a softer gradation, and is suitable for portraiture. Owing to the freedom from halation, it permits of securing good pictures in strongly contrasting views. This make of plate is especially applicable to architectural views, as a somewhat long immersion in the developer is not likely to loosen the film. The gradation of the Bayer plate is sharper and resembles the plates adapted to amateur work. It seems to be adapted for ordinary work. The matt plate gives a harder result than the shining one, which resembles the very rapid plates for amateur work. The Mimosa plate shows a moderate sensibility to yellow-green rays; in the Bayer matt plate this sensibility is decidedly lower, but the other type of Bayer plate (shining) shows a higher sensibility than the Mimosa plate.

The new forms of plates seem to be especially applicable to x-ray work. Inasmuch as large plates are often required, the saving of expense is material. It is also possible to secure two pictures at one operation by placing two plates together, which is an advantage, as it permits the operator to have one plate for record, while the other is passed on to the person ordering the picture. Then the freedom from breakage is a most valuable property.

The article from which these data are taken gives a number of photographs illustrating the points presented.

Vignetted Portraits

At one time the vignetted form of the portrait was very popular, and especially with people of artistic taste. Its popularity, however, led eventually to its ostracism by the same people of culture because low-priced photographers, forced to comply with the desires of their customers, could not afford to give the attention to the proper execution of the vignetted portrait, and nothing in photography is more execrable than a badly made vignette.

It is true that on first consideration the vignetting method of portraiture looks like a saving of labor, and rather as an excuse for want of skill in posing and composition and management of accessories.

This is true to a certain extent, but the production of a good vignette demands thought, taste, judgment and artistic skill. There must be as careful study of the lighting as in a full-length portrait, and in reality if the figure itself is not properly posed

the head will be out of proper relation with it, and look strange and unnatural in its isolated condition in the bust vignette.

Besides, additional taste and skill is needed in the printing, for it is possible for the printer to spoil all the good features secured by the operator. In the first place, we may claim that any attempt to get artistic vignetting by means of vignetting glasses or special stock graduated papers is a delusion and a snare. You merely get various shapes about the head with blurred outlines.

One of the simplest plans, and an effective one in tasteful hands, is the use of a card with a properly shaded opening, with cotton wool delicately around the border, placed at a proper distance from the head and inclined at a proper angle.

Another plan, which is more convenient, consists in the use of flake white on the glass side of the negative and worked with the fingers into regular grain.

A vignetted head must be lighted in such a way that there shall be no strong contrasts of light and shade. The whole should be soft and rounded, yet it must not be flat, but not so pronounced or brilliant as a head supported by a dark background. This reminds us to say what kind of background is most suitable.

Never employ a dark ground, neither go to the opposite extreme and use a too light background. The ground ought to be just dark enough to relieve the light side of the face, and light enough to set off the shaded side. But the ground should not be uniform of an even tint.

Let us suppose a head placed before a background of medium tint lighted by a direct light. The background would receive that light obliquely. The light falling upon the face does not reach the background on the side the light comes from; therefore, the lighted side of the face is relieved by the shaded part of the ground, but, passing behind the head, it lights the background on the shaded side of the head, at once throwing the whole face forward. But left this way our portrait lacks balance. It is all shade on one side and all light on the other, but letting the light complete its work we see the shadow of the head thrown upon the background, just by the shoulders, which gives the balance needed. So by merely acting upon these principles of light and shade we have what is wanted, the head relieved and coming forward and the background itself plays its part, and an important one.

The Cause of Bad Tone With Sulphide and Remedy Therefore

Sepia seems to be a favorite tone with most pictorialists. At a recent exhibition of work of considerable artistic merit we found in a collection of over a hundred prints all on bromide papers, just five in the normal black and white of the untuned bromide paper. To our personal taste these latter seemed richer in effect than any of the sepias, and we think our predilection for black and white did not influence our judgment so much as our disaffection for the poor tones of the majority of the sepia prints. About a dozen of the prints, in a real beautiful artist's sepia, were most charming and very agreeable to our eyes.

We have frequent inquiries how to secure sepia tones, but in our experience with workers we have come to the conclusion that few really know what a beautiful sepia is, for we are asked to admire what we would like to call dirty yellows or smudgy browns. Some workers, when convinced of the beauty of sepia, discard the bad tone prints and seek for means of getting the genuine tone.

Now the process they all use is the sulphide toning method, and in itself it is an excellent process—then why do so many fail with it.

The cause of the bad tones is due to the deterioration of the sodium sulphide, which is very prone to decomposition and does not retain its integrity very long. By decomposition a certain proportion is changed into thiosulphate, or our old friend or enemy—"hypo"—and as soon as this body manifests itself, look out for the bad tones or total refusal to tone at all.

The first indication of something going wrong is apparent when you notice the formation of a dull, yellowish-brown image, which seems in a little while to discontinue to go any further. That is, toning seems suspended; and so it is. Nothing but a pale yellow image being perceptible. Sometimes the image bleaches out; really, it is fixed out by the hypo formed in the decomposition of the stale sulphide.

There is a chance to apply a remedy when the toning solution fails to proceed, and the print has not been left too long in the solution, in the forlorn hope that it may get stronger, but let us first remark that proper toning always goes on rapidly, and an effect ought to be apparent in the first half minute. If no action is visible at the expiration of this time, it is fair in-

dication that the toning solution is deteriorated and there is no hope of its starting up again. Neither is it any use to pour off the stale solution and apply good, fresh solution of the sulphide, for the reason that your decomposed sulphide solution has already attacked the image, and it has no chance of regeneration. The image has been converted into a sulphide, but one of the photographically unpleasant kind.

What is the remedy we spoke of above, which helps if we take the print in time?

Before we undertake any toning, or rather retoning, we must reconvert the image by use of a powerful bleacher. Take ten grains of potassium bichromate and a scruple (20 drops) of strong hydrochloric acid to every ounce of water. Wash the print well to get rid of the sulphide, and place in the bleacher which acts rather slowly. It is best to let it stay in bleacher for half an hour, to be sure the conversion is thorough, then wash and redevelop in a rather concentrated developer, metol hydroquinone. The image produced is, however, more brown than sepia, but is rich and pleasing, and often preferable even to a fine sepia.

But if you prefer the good sepia tone, you must be sure to use perfectly fresh sulphide.

A Method for Getting Luminous Shadow in Prints

Every pictorial worker knows how to improve the shadows of a thin negative by printing it upon a coarse-grained paper. The shadows in the print show up with greater luminousness than when an impression is received upon high-gloss paper.

But few of the present-day workers know that as far back as 1868 when practically glossy albumen paper was the medium for printing, G. Wharton Simpson proposed to try the effect of parchementizing the paper after the print had been made, to improve the effect.

He speaks so enthusiastically of the beautiful results produced that it might be worth the while for our present-day pictorialists to revive his method.

The change produced in the paper by the process of parchementizing it doubtless insures the print from tearing and, besides, there is great probability that the photographic image may be thus made less liable to change by the treatment the fibre of the paper undergoes.

It is well known that the cellulose of which paper is composed may be made

tough and hard, as well as tenacious, to an extraordinary degree, by immersion in dilute sulphuric acid. A strip of paper which would break under a slight strain after this treatment will support a weight twenty times that which caused it to snap.

The surface of the paper also becomes harder and finer in texture.

An engraving, for instance, so treated acquires a softness and delicacy from the contraction of the fibre of the paper, which adds to its artistic beauty.

Mr. Simpson at first suggested the preparation of the paper by the method before sensitizing it, but a series of practical difficulties, such as puckering and curling up, prevented uniform imbibition of the sensitizer.

Mr. Crooks, the distinguished physicist, then proposed trying it upon finished prints.

The result, Mr. Crooks declared, was such as he hardly anticipated.

The tone of the photograph, even in the most delicate half-tones, was preserved, thus preserving, or really enhancing the tonal values of the picture.

The paper, moreover, would bear the roughest kind of handling during the washing, even standing rubbing with soap and water, without the slightest abrasion of the surface.

Our present varieties of printing-out paper, from the nature of their coating, precludes their use with this method; hence the necessity of making the print on plain silver paper, which, by the way, lends itself admirably to pictorial printing.

The prints which we made by this method were on plain silver paper, and on platinum effect was certainly beautiful. The method might be adapted to gum printing, too.

In some few cases we noticed a rather too rough appearance of the surface on drying, but this is easily removed by placing the print before it is thoroughly dry between blotters and subjecting to pressure.

NOW FOR THE METHOD

Take a good stoneware jug holding a pint or more and stand it in a large pan.

Measure out eight fluidounces of sulphuric acid, pour it in the jug, then measure four ounces of water and pour a little at a time of it into the acid, stirring with a glass rod, then cover over the jug with a sheet of glass. The mixture of the water with the sulphuric acid causes considerable heat, and this is why a stone jug is used, and for fear the jug may split, it is placed in the larger dish.

Have ready three very clean trays, porcelain or glass (the acid and water having cooled). The first tray should be a little larger than the size of the sheet of paper of the print. The other two trays should be larger, holding about half gallon of liquid.

Into the first tray pour the acid mixture, fill the other two with clear water, but put into the third dish a few drops of ammonia (strong), four or five drops being sufficient.

Take now the print, toned and fixed, and thoroughly washed from the hypo, and thoroughly dry, and lay it picture side down on the acid (No. 1), avoiding bubbles, then instantly lift it up and lay the blank side (back of the print) on the same bath of acid. This is easy to do. As the wet side curls slightly, press it slightly under with a rod.

If any part is not covered by the solution, submerge it and leave the sheet immersed for 30 seconds to two minutes, according to the quality of the paper used. Very thin papers require only ten seconds, heavy grades, more proportionally.

At the expiration of the soaking, gently raise one corner out of the acid bath, and lift the paper out by this corner.

A small fold of blotting paper may be used to guard the thumb and finger from the acid on lifting the sheet. Draw off for a couple of seconds, then with a quick movement completely immerse at once the sheet in the bath of clear water No. 2, and move it around in all directions to get rid of the acid not absorbed by the fibre as quick as possible.

Now lift it out in a perpendicular direction, and fling it again two or three times in the same water, and finally transfer to tray No. 3, with the weak ammonia, and let it lie there till you finish the rest of the prints.

Remember, however, to put fresh water in tray No. 2 with every three prints, and have ready a piece of blue litmus paper to test the alkalinity of bath No. 3. If there is the slightest indication of redness on the blue paper, add a few drops more ammonia.

Immediately on finishing the batch of prints, wash well in four or five changes of water, and dry. If the prints remain too long in the alkaline bath the paper is somewhat affected.

The crumpled look which was spoken of above, in some cases, improved the appearance of the print.

Behavior of Elemental Bodies

Until quite recently it was firmly believed that there were a number of bodies in the material universe which constituted irresolvable elements; ultimates beyond which chemistry could not penetrate.

To be sure, a few far-seeing investigators intimate from the anomalous behavior of some of the so-called elements the possibility of resolution their opinion was regarded as chimerical. But recent discoveries revolutionized the orthodox views and chemists began to doubt the inviolability of the fundamental elements to such an extent as even to claim the probability of numerous forms of the elements.

There may exist about each element a series with associate characteristics, and a possibility even of the evolution of elements from some primal one, corresponding to the view of biologists of the evolution of the existing form of animated nature from protoplasm.

The chemists of the past did note that certain elemental bodies do present themselves under diametrically different forms, and exhibit properties not at all reconcilable with those set down to the performance of the element in its general presentation.

They called different conditions of the same element allotropic conditions, and there left the matter rest.

Amorphous phosphorous (red phosphorous), for instance, is a form of the elemental phosphorous, different not only in appearance from ordinary phosphorous (white phosphorous), but its behavior is quite different.

White phosphorous melts at a low temperature, while the red variety does not melt at a very high temperature, turning to a vapor without going first into the liquid form. White phosphorous is poisonous, red phosphorous is innocuous.

Selenium, another element, when slowly cooled is a good conductor of electricity. Ordinary vitrious selenium obtained by rapidly cooling after heating, on the contrary, is an insulator and loses the ordinary properties of the body.

As the methods of investigation became more refined, these seemingly exceptional bodies which did not conform to the rule set down for elements, were found to really exemplify a general law.

Spectrum analysis showed that many bodies, according to the temperature they may be under, show themselves in allotropic conditions.

The probability, therefore, is that all of the elements will be found to exist under various states.

The research into what is called the colloidal state shows that certain metals are capable of being so modified as to lose all the properties of the metal from which they were derived, and to simulate something of the behavior of the organic bodies.

We know that the inorganic bodies, such as iron sulphur, etc., constitute the structure of living organisms, but transformed so as to be essentially something distinctly different from iron sulphur, etc., as we have these bodies.

Faraday, as far back as 1855, remarked that silver deposited upon a plate of glass in a very thin film had a great refractive power, but possessed feeble transparency. If the glass be heated to 400 degrees, the silver is found to lose the greater part of its refractive power, but to gain in ability to transmit the light, and so he boldly affirmed that it was due to a difference in the nature of the silver under different conditions, and this has been only recently established.

Silver, whatever its origin, when treated with nitric acid, invariably yields silver nitrate, and we can get from this silver nitrate by decomposition invariably the same quantity of metallic silver. How, then, is it possible to suspect that there exists in reality metals differing radically, although known by the general name of silver. Nevertheless, the truth is established beyond a doubt that so-called simple bodies may vary within wide limits.

That is, we have typical elements and varieties of the type just as in the animal and vegetable kingdoms.

To bring about this wonderful transformation it looks as if some gentle force in nature may be enlisted to our service; rather than the mighty forces ordinarily employed to disrupt matter, for notwithstanding the stability of a body do we not find that dissociation is effected by the mildest force in the universe, a feeble ray of light?

A New Use for Airplane Photography

There recently appeared in the *London Times* an advertisement of the offer for sale of a Suffolk estate in which the general features are admirably shown by two airplane photographs. It is claimed that this is the first application of aero-photography for such purpose, and it is said that the results are very satisfactory. In many

cases the taking of photographs from the ground level is impossible, owing to irregularities or the presence of trees. The cases in which the estate is situated at the bottom of a basin on the side of which the telephoto-apparatus may be fixed are few and far between, and even under such conditions the operator cannot hope to show the surroundings of the principal buildings and their relation to the grounds and to the vicinity. The views mentioned were accompanied by eight views taken from the ground level, and the airplane views compared very favorably with these, the architectural features of the mansion having been as well brought out as by those taken in the ordinary way.

Preservation of Farmer's Solution

In describing Farmer's solution, the books generally refer to its lack of keeping qualities. The change is due to the action of the hypo upon the ferricyanide, the latter being reduced to ferrocyanide, which is without action on the silver deposit, hence the substance which brings about the reduction is gradually lost. Even the inexperienced can note, in using the solution, how the liquid steadily loses its characteristic tint, and at the same time become slightly turbid. The rapidity of action of this solution is so marked as to be evidenced by a simple experiment. A solution of potassium ferricyanide is divided into two portions: to one portion is added a solution of a uranium salt; to the other is added a small amount of hypo solution, and then promptly a solution of the uranium salt. The first solution shows no change, the other immediately assumes a chocolate color, due to uranium ferrocyanide, potassium ferrocyanide having been formed by the action of the hypo upon the ferricyanide. The rapidity of action can be similarly shown by adding to a mixture of a uranium salt and a ferricyanide, a small amount of hypo.

Some time ago G  ar proposed to add glucose or a bromide to Farmer's solution to render it more stable. Dr. A. Rossi, investigating the effects of these agents, prepared several lots of Farmer's solution, and added to one lot, 1 per cent. of glucose, and to another the same proportion of potassium bromide. He found, however, that both solutions spoiled at about the same rate as the untreated solution, and, hence, it seems that G  ar's suggestions are not of practical value. It is true that exact experiment shows that both these additions do slightly

retard the change, but only so little as to offer no practical advantage. Rossi then tried the method suggested by Namias, namely, the addition of about 4 per cent. of ammonia. Namias, however, made his experiments directly with silver deposits, finding that these were dissolved by the ammoniacal solution. Rossi followed another method. He determined the action of the solution on a uranium salt. His experiments showed that such addition does delay the action of the hypo on the ferricyanide. It appears then that a preservation of Farmer's solution can be secured by adding to it 4 per cent. of strong ammonia, which addition does not have an unfavorable effect on its reducing action.—*Photo-Revue, from Rev. Fotograf. Ital.*

Forming a Camera Club

Have you a Camera Club in your town? If not, write to Mr. L. F. Bucher, Secretary, Associated Camera Clubs of America, 878 Broad Street, Newark, N. J.

Mr. Bucher has just written a booklet under the title, "The Camera Club—Its Organization and Management," which will be sent to you for the asking.

In this booklet he tells you why you should have a Camera Club, how to start one, how to organize it and how to make it a success. There are just twenty-four pages brimful of precisely the information you need on the subject. The book is published and distributed by the Associated Camera Clubs of America.

Mr. Bucher is an enthusiastic camera man and his enthusiasm is pretty contagious. He believes in Camera Clubs because he believes that two heads are better than one and that in the mutual exchange of ideas and in the pooling of their mutual problems, amateurs can be of great help to each other. It's lonesome working alone with no other help than a textbook, and no other source of inspiration than the photographic journal. At least, that is Mr. Bucher's gospel and he gives mighty good reasons for the faith that is in him.

In the preparation of this booklet he has collected the experience of various clubs in different parts of the country so that, as he observes in his foreword, "the data obtained may be considered fairly representative of conditions throughout the U. S. A."

In conclusion, he says, "We want to see a successful camera club in every town and village in America, and we stand ready to give whatever assistance is possible."

Preserving Pyro Developer

Louis Cordier, in *Photo-Revue*, gives a suggestion for a pyro developer that he claims has excellent keeping qualities and yields satisfactory pictures. He prepares two solutions.

- A Water 500 c.c. (1 pint)
 Sodium metabisulphite (or oxalic acid) 10 gm. (150 gr.)
 Pyro 50 gm. (1¾ oz. av.)
- B Water 1000 c.c. (1 qt.)
 Sodium sulphite (dry) 100 gm. (4 oz. av.)
 Sodium carbonate (dry) 50 gm. (2 oz. av.)
 Potassium bromide 2 gm. (30 gr.)

Placed in bottles full of the liquid and well corked, these solutions will keep for months. For development 1 volume of A is mixed with 9 volumes of water. The plate is immersed, and after one minute a small amount of B is added. After one minute another small portion of B is added, and so on until an image appears. More of B is then added, and the development continued until complete. For tank development the following mixture is recommended:

Solution A 1 volume
 Solution B 5 volumes
 Water 8 volumes

Develop for 20 minutes at about 70°.

Tax Tribulations of German Photographers

If the cynical Frenchman was right when he said that there is something in the misfortunes of our best friends that does not wholly displease us, it is more likely to be true that the troubles of our enemies give us pleasure. German journals afford us an opportunity to see how seriously the tax injustices bear upon the photographer. It appears that a tax of 15 per cent. is levied on photographs above a certain size (about 12 x 16 inches). As these are now usually made by enlargement from small negatives, it became a question as to which part of the work should be taxed. The practise is different in certain parts of Germany. In Berlin, the tax is levied on the negative intended to be used for enlargement; in Frankfurt on the enlargement. The consequence is that if a Berlin photographer has an enlargement made in Frankfurt he pays the tax twice, but if a Frankfurt photographer has the enlargement made in Berlin he does not pay any tax.

Notes on Reducers

(*Photographische Chronik* from *Bull. Soc. Fran. d. Phot.*) Wellborne Piper tried the plan of mixing potassium ferricyanide with ammonium persulphate, instead of "hypo," in preparing Farmer's solution, but the result was not satisfactory. The action is slow, and the solution spoils quickly. Piper made a comparison between the action of ammonium persulphate and the corresponding potassium salt. The latter does not absorb moisture from the air, and a solution of 1 per cent. strength was as active as a much stronger solution of the ammonium salt. The potassium salt is, however, much slower of solution; even in fine powder it requires some time to dissolve. The persulphate reducers appear to be most active when they contain a little silver. Piper, therefore, recommends that to activate the mixture, a few drops of a formerly used solution should be added or a fragment of a rejected negative allowed to soak in the liquid until the reduction of the image on this is evident.

It has been pointed out recently by Lumière and Seyewitz that these reducers are satisfactory only when slightly acid.

Announcement has just been made that the dates for the Second Annual Exhibition of Pictorial Photography to be held next fall in the Frederick & Nelson Auditorium, Seattle, Wash., have been set for November 1st to 12th, inclusive.

This competitive exhibition was inaugurated last fall, there being 1100 entries, from more than 40 States, while Canada and several foreign countries were represented. Last year the competition was limited to the work of amateurs, but this year this restriction has been removed and invitation extended to all pictorial photographers, whatever their status and wherever located, to send in their prints.

There are no separate classifications in this competition, portraits, studies in still life, landscapes—all types—entering on an equal basis, the only restriction being that hand-colored photographs are barred. The board of judges will be selected from among the most prominent photographers and painters in the Northwest. The prizes offered are: First prize, \$100; second prize, \$75; third prize, \$50; five prizes of \$10 each and ten prizes of \$5 each. The exhibition will be held in the Auditorium of the Frederick & Nelson store, a large hall especially well adapted to this purpose.

Removing Films from Glass Plates

The older photographers were quite familiar with the practice of cleaning negatives for further use. The collodion films used in the standard wet process was rather more resistant than the now familiar gelatin films, and strong chemicals were required to bring the glass back to a proper condition. A not infrequent accident due to imperfect cleaning was the appearance of a feeble image of a former impression. The present extremely high price of glass in Europe has given rise to several economies. One of these was noted in a recent issue of this journal, being the use of paper as a support for the film. Two German firms are now offering these, and the product seems to have been satisfactory. A writer in *Photo-Revue* gives the following somewhat ingenious process for removing ordinary gelatin films from glass. The plates are soaked in a solution of common salt (about 7 or 8 per cent.) for at least fifteen minutes, and then transferred to dilute sulphuric acid (5 to 10 per cent.). Hydrochloric acid is formed in the body of the film by the action of the acid on the salt, and the loosening of the film begins very soon. By means of a soft brush or stick the dislodgment can be facilitated and the plates can be then washed and dried.

A Colorimeter Operating on the Subtractive Principle*

L. A. JONES

[ABSTRACT]

In this article a new type of colorimeter operating on the subtractive principle of color mixture is described. By means of a telescopic element an image of the object whose color is to be measured is formed in the plane of the photometric cube of the instrument. In this way one-half of the photometric field is illuminated by light of the color that is to be analyzed. The other part of the photometric field is filled with light, the color of which can be varied so as to match that of the unknown. As a source of this light a small incandescent automobile headlight lamp is used, operated at constant voltage, and screened with a filter of such quality that the transmitted light matches noon sunlight in color, noon sunlight being defined as standard white. Between this lamp and the photometric cube are placed four gelatine wedges, three

of which are colored, and one of neutral tint, the neutral tint wedge being used for adjusting the intensity factor in the comparison field. The three colored wedges used are the attractive primaries, namely, minus green or magenta; minus blue or yellow; and minus red or blue-green, these colors being complementary to the three-color additive primaries. Any unknown color can be matched by using two of the colored wedges in conjunction with the neutral tint wedge, and a complete specification of color is therefore obtained by giving the scale readings of the three wedges used. In this way a numerical specification of color in terms of the constants of the instrument can be obtained. Such a determination is not a true specification of color as such, but by means of suitable calibration tables these readings can be converted into the absolute specification of color in terms of hue, saturation, and an intensity factor.

For convenience in measuring the color of various materials, special attachments are provided with another standardized lamp for illumination of the samples. As a standard of white against which the working lamps may be checked from time to time, a standardized lamp with an adjusted filter is provided in a suitable housing which may be attached to the instrument. By means of this the proper operating current for the working lamps may be determined at any time. The monochromatic analyses of the three colored wedges used in the instrument are given in graphic form in the paper.

A new application of X-Ray photography was announced to the French Academy of Science by Dr. André Chéron. "By means of X-Rays," said Dr. Chéron, "the difference between genuine old paintings and modern forgeries can be protected. The old masters primed their canvasses before painting with carbonate of lime and size. The difference between this priming and the modern priming is clearly shown by the X-Rays. Again, certain pigments were used which were made of mineral salts, but which are now nearly always made of vegetable substances, much more transparent." The picture forger by introducing mineral into his pigments may yet be able to defeat the X-Ray photographer, but for the present, at any rate, the way of sinners is made a little harder.—*The Professional Photographer*.

* *Jour. Opt. Soc. Amer.*, November, 1920, p. 420. Communication No. 105, from the Research Laboratory of the Eastman Kodak Company.

Positives in Black Resembling Platinum Prints

(*Photo-Revue.*) Sheets of paper of good quality are floated for a few seconds on the following solution:

Water150 c.c. (5 fl.oz.)
Uranium acetate 8 grams (250 grains)

The paper is then dried in a warm, perfectly dark place, exposed for ten minutes under the negative, and laid aside for a few hours before development. The development is carried out by immersing in water at about 110° F., and then in a solution of potassium ferricyanide. In the latter bath the image appears in strong blood red tint. To convert this into black, the sheet is immersed in a solution containing 5 per cent. of ferric chloride and 1 per cent. of hydrochloric acid. The image begins at once to assume a greenish tint which steadily deepens. When the desired depth is obtained, the sheet is removed and washed in running water. It is an advantage if this wash water is slightly acidified with hydrochloric acid. Long washing is not necessary. It is stated that fine prints with clear high-lights and fine gradations are thus obtainable.

Amino Acids of Gelatin

THE amino acids which occur in the protein gelatin have been separated and determined by H. D. Dakin (*Jour. of Biol. Chem.*, 1920, xliv, 499—529). The per cent. of each amino acid found was: Glycine, 25.5; alanine, 8.7; leucine, 7.1; serine, 0.4; phenylalanine, 1.4; tyrosine, 0.01; proline, 9.5; hydroxyproline, 14.1; aspartic acid, 3.4; glutamic acid, 5.8; histidine, 0.9; arginine, 8.2; lysine, 5.9; ammonia, 0.4. The sum of these ingredients amounts to 91.31 per cent., while previous analysts have accounted for considerably less of the total amino acid content of the gelatin, their sums ranging from 42.1 to 70.7 per cent. out of the total 100 per cent. It is noteworthy that traces of tyrosine were always found, although this amino acid hitherto has been considered absent from the gelatin molecule. The following amino acids were not present in gelatin: Valine, isoleucine, aminobutyric acid and hydroxyglutamic acid. Unidentified sulphur derivatives were also found in the gelatin molecule. Since isoleucine and valine are absent, and considerable leucine is present, gelatin is a very suitable material for the preparation of optically pure leucine.

Getting Rid of the Dark-room

THE time may not be far distant when it will be a familiar incident in picture-making to expose the plate in the dark and develop it in the light. In fact, this has already been done, for it is possible to affect the ordinary emulsions by emanations from some of the common metals, zinc, mercury, magnesium and aluminum, and by the process of developing after fixing to carry on the development in full light. The pictures are, however, merely interesting from a scientific point of view. Procedures for permitting development in sufficient light to operate comfortably, have been for years before the photographic world, but have not come into general use. Lately, several methods apparently quite practical have been announced. The most striking perhaps is that of Lüppo-Cramer, who has found that by immersing the plate in a weak solution of phenosafranin for a minute or so, the film becomes so insensitive that the plate can be developed at a moderate distance from a candle flame. For a description of this method see THE PHOTOGRAPHIC JOURNAL OF AMERICA for February, 1921. The dye-stuff is now obtainable in this country of native manufacture, sold under the title "Safranin A extra, concentrated," being soluble in both water and alcohol. The amount used is quite small—1 part of the color to 2,000 of water—which will be about 8 grains to the quart (0.5 gram to the 1,000 c.c.). The gelatine becomes colored, but most of this washes out.

A later and still simpler method has been described by the same person, in which a very weak solution of amidol is used, 0.02 to 0.05 per cent. The strongest solution on this ratio will be 1 part to 2,000, just the same as in the case of the safranin solution mentioned above. The action in both cases is believed to be due to a special desensitizing influence on the emulsion, and not a mere shielding from the light. Lüppo-Cramer claims that the amidol makes the plate 50 to 100 times less sensitive, and, that in the subsequent development, a yellow light may be used with all plates—at least ordinary plates; it is not stated whether autochromes can be so treated—and that most developers are not unfavorably affected in their action, except glycin, which gives dichroic fog. Hydroquinone becomes more energetic. Addition of sulphite to the amidol materially reduces its desensitizing action.

Still another type of treatment for the same general purpose has recently been presented by Renwick in *The Photographic Journal of the R. P. S.* Renwick has studied the solvent action of potassium iodide on silver bromide, and finds that it is converted into iodide, and that this latter may then be dissolved by immersion in strong solution of potassium iodide. 100 C.C. of a 30 per cent solution of potassium iodide will dissolve 3 grams of silver iodide. It is, therefore, not difficult to fix a plate in a strong solution of an iodide. Economy is promoted by using sodium iodide. Such a bath, however, is costly, and also injures the gelatine film. In a lecture delivered in March, 1920, before the Liverpool section of the Society of Chemical Industry, Renwick demonstrated the following facts:

(1) That it is possible to fix an exposed plate in a strong iodide bath, and after washing out the salts to develop an image in silver by means of any of the well-known physical developers, and (2) that it is possible to develop an exposed plate in an alkaline amidol solution after the whole of the silver salts in the plate had been converted into iodide. A suitable bath for this purpose is:

Sodium or potassium iodide..	10 gms.
Cryst. sodium sulphite	20 gms.
Sodium or potassium sul-	
phocyanide	30 gms.
Water up to	1000 c.c.

With the assistance of Mr. Olaf Bloch, the influence of numerous salts and other substances in various proportions was tested in order to discover the composition of a bath which would entail the least loss of image by the treatment. Certain hardening and anti-swelling agents, *e.g.*, formalin and sodium acetate, were found useful for counteracting the softening action of the sulphocyanide on the gelatine. An addition of 1 to 2 per cent of potassium bromide appeared to preserve the delicate half-tones to some extent, as did also 2 per cent of gum arabic, 10 per cent of alcohol or the addition of a drop or two of weak silver nitrate, sufficient to yield a faintly turbid solution, but no great improvement on the simple formula given above was found, provided it is used quite cool (55° to 60° F.).

The sulphocyanide has a marked influence on the subsequent developing process, greater density and detail being obtained when it is used. It undoubtedly modifies the physical character of the silver iodide formed in the process, and its effect is

probably related to this fact. The chief use of the other additions mentioned seems to be to slow the reaction; slower conversion to iodide invariably led to more complete preservation of the image. One of the interesting features about these iodized plates is that they are so insensitive to light that they can safely be developed in a strong white light without fogging, except when certain developing agents are employed. The most notable of these exceptions is hydroquinone, which has a well-marked sensitizing action on silver iodide, and causes it to fog in a light in which alkaline amidol is a perfectly safe developer. Development of the iodized and well-rinsed plate in an alkaline amidol developer requires a long time to attain completion, but ten minutes at 65° F. is usually sufficient for a plate which, when used in the ordinary way, would give average density in about four minutes in a normal pyro-soda developer.

A remarkable result of the experiments is that bathing the plate in a solution of an iodide, increased its sensitiveness to orange or red light, this result obtaining even with a solution as dilute as 1 part to 59,000 of water. Renwick gives a series of spectrum photographs to demonstrate this.

All these investigations have an important bearing on one of the great problems of photographic physical chemistry, namely, the nature of the latent image, but they seem to complicate the matter and not to elucidate it. One of the most difficult phases of the problem is presented in the method of developing after fixing. In this procedure, the plate becomes, as far as can be judged, entirely freed from the silver salts, yet is easy to bring out the image and even to carry it to such density that the plate will be no longer available as a negative or transparency as the case may be.

Even with these methods, the dark-room is not entirely eliminated, for the transfer of the exposed plate from the dark-slide to the desensitizing solutions must be made without exposure to ordinary light, but this is only a momentary operation, and the methods likely to be satisfactory in many ways.

The Thirtieth Annual Exhibition of the Toronto Camera Club, in affiliation with the Royal Photographic Society of Great Britain, will be held at the Canadian National Exhibition, Toronto, Canada, August 27 to September 10, 1921.

Recent Patents

1,371,722. Camera. In a camera, a body portion, a film receptacle therein, a film spool removably mounted in the said receptacle and means for turning said spool comprising a member threaded in the spool, a device for rotating the said threaded member, and yieldable connections between the last mentioned means and the threaded member.

1,371,786. Motion-Picture Reel and Container Therefor. A moving picture reel comprising a hub portion, disks of different diameters secured to opposite ends of said hub portion, a cover adapted to receive the disk of smaller diameter and inter-engage the disk of larger diameter for inclosing the reel, and separate means passing through the hub portion of a plurality of said reels for securing said reels in contact with each other.

1,371,440. Automatic Camera. The combination with a camera including a casing and folding front, of a film winding member, a driving gear operatively connected to the film winding member, a spring drum, a clutch connection between the spring drum and the driving gear, means actuated by movement of the folding front of the camera for operating the spring drum, and means for opening the clutch connection between the drum and driving gear.

1,371,969. Color-Picture. An apparatus for taking or projecting images, comprising a lens, a transparent filter and a compound prism located to act on a ray of light successively, said compound prism consisting of two prisms located one in advance of the other and having a common base, while the edges of said prisms remote from such base extend in mutually perpendicular direction, and said filter having four portions arranged in two pairs of complementary colors and correlated to the images formed by said compound prism.

1,371,970. Apparatus for Taking and Projecting Pictures in Colors. In an apparatus of the character described, a unitary structure, comprising a prism having two parallel mirror surfaces, one of which is semi-transparent and having a light admitting face at an angle of substantially 45° to the planes of the said parallel mirrors, said prism being arranged to divide a beam of light into two parallel beams; a second prism having two parallel mirror surfaces, one of which is semi-transparent and having a light admitting face at an angle of substantially 45° to the planes of the said parallel mirrors, the light admitting face

being in contact with a light exit face of the first mentioned prism, said second prism being arranged to sub-divide both of the two parallel beams to form four parallel beams; a 45° prism filling the space between the first and second prisms and a 45° prism contacting with the semi-transparent mirror face of the second mentioned prism, substantially as and for the purpose described.

1,371,438. Device for Making Stereoscopic Photographs. In a device of the class described, a stationary platen, a platen mounted thereon for pivotal and sliding movements, and a single lens camera supported by the movable platen.

1,372,803. Photographic Camera. A photographic camera for films comprising means for closing the camera in two operations, and means for setting the camera for the next picture automatically actuated by the two closing operations of the camera, ready for exposure after the camera is opened.

1,371,218. Moving-Picture Projector. In a moving-picture projector, in combination, a plurality of movable projecting means and means whereby a movable projecting means may be revolved upon the axis of an edge of a film therein in order that the pictures upon the film will be co-ordinated upon a screen with the pictures upon a film within one of the other projecting means to produce an extended picture.

1,373,053. Method and Apparatus for Producing Colored Photographic Pictures. The method of producing colored pictures which comprises mounting a pair of films separately and under tension, superposing said films with their faces contiguous, exposing said films, separating said films, treating each film separately, reassembling the films in the same superposed position without removing them from their mountings under tension, and fastening said films together while so superposed under tension.

1,371,507. X-Ray Stand and Table. In an x-ray table, end members, side members connecting said end members, a table top, said table top being pivotally secured to the upper portion of one of the said end members, a carriage carried by the said table top, and x-ray tube supported by the said carriage, a fluoroscopic screen frame rigidly supported solely on the said carriage, said screen frame and said tube being disposed on opposite sides of said table top so that the screen will always lie in register with the tube for all positions of the tube.

1,371,400. Photographic Continuous-Printing Apparatus and Process. In an apparatus of the character described, a member having a central converging wall portion, said member also being provided with other walls which surround the said central portion, the space between the said walls serving as a container, a lens mounted at the end of the converging wall portion, means for guiding and supporting a film strip, which means lies beyond the lens and means for guiding a sensitized strip, which means is located at the divergent portion of the said slanting wall.

1,372,746. Aerial Photographic Apparatus. In an aerial photographic apparatus, the combination with a horizontal frame and a universally movable camera mounted therein, with the axis of its lens vertically disposed, said camera being adapted to rock in two vertical planes normal to each other, of controlling mechanism connected to said camera and by means of which its position may be shifted and a universal spirit level mounted upon an element of the controlling mechanism and having its zero position correlated with the vertical position of the axis of the camera lens.

1,372,675. Moving Picture Camera. The combination with a camera having a lens adapted to produce an image, of a light tight magazine having an aperture therein, means for holding said magazine in said camera in such manner that the image from said lens is projected through said aperture, a feed roller in said magazine, a take up roller in said magazine, means within said magazine for carrying film from said feed roller across said aperture and onto said take-up roller, a holding means arranged to prevent rotation of said take-up roller, and means within said camera for disengaging said holding means when said magazine is inserted in said camera.

The Toning of Transparencies

AN editorial in the *Photographische Rundschau* discusses this question with especial reference to lantern slides. The writer complains that these are mostly sharply contrasting in black and white, and states that the introduction of intermediate tones is possible by modification of the developer, and by control of exposure. The tones so obtained are durable and uniform.

Toning by means of certain mineral solutions applied to the finished plate has been

long known, salts of uranium, iron and copper having been especially employed, but these methods often diminish the transparency of the plate and are in some cases not very durable. In the process given by the writer the nature of the emulsion has considerable bearing on the result. Those consisting largely of silver chloride give warmer tones more readily than those in which silver bromide is the main ingredient. Good, durable sepia and olive tones may be obtained with the common developers, by using different proportions of sulphite, or even omitting this ingredient. The following formula is given:

2% pyro solution2 fluid ounces
10% caustic potash solution2 fluid ounces
10% potassium bromide solution8 drops

Transparencies developed with this solution give warm sepia tones which by washing pass into olive green. The gelatine is also colored by the developer, but this is discharged in the washing. If to the above developer, 30 grains of anhydrous sodium sulphite are added the tone becomes a cold sepia and on washing turns to dark olive. If the amount of sulphite is doubled, the tone remains dark sepia after washing. Again doubling the sulphite, the tone becomes quite black. The developer must be used fresh in consequence of the small amount of sulphite.

An "Always-Ready" Plate Backing

AN "always-ready" anti-halation backing in a full sense of the term; the mixture being always ready to hand without becoming dry in the pot, or absorbing an undue proportion of water from the atmosphere, and moreover the plate is ready for exposure immediately; no drying being required, while finally the developer is in no way damaged, so that no wiping-off is required previous to development; nevertheless, if desired, a full view can be had at any stage of the development, as a touch with a soft brush clears any part of the backing instantly during development, if an under-mentioned precaution is taken.

This combination of advantages is realized by taking advantage of the hygometric and other properties of ox-gall, the ox-gall being used in the form of the purified ox-gall of the pharmacist; additional and incidental advantages are ease and certainty

of application, notwithstanding finger marks or like greasy patches on the back of the plate, and the complete elimination of halation under the most trying conditions; the optical union of plate and backing being perfect, owing to nearness in refractive index, and the peculiar soap-like viscosity of the mixture.

The purified ox-gall of the British Pharmacopœia (*Fel bovinum purificatum*) can be obtained as a yellowish-green, viscous mass from any pharmaceutical chemist, or it may be prepared by following the instructions on page 147 of the 1914 edition of the British Pharmacopœia. Evaporate half a litre of fresh ox-bile to one-fourth of its volume; shake with twice its volume of 90 per cent. alcohol. Set aside to clear, filter and evaporate on water bath to the consistency of an extract.

The backing mixture consists of one weight-unit of the purified ox-gall, four weight-units of gum arabic mucilage, and one weight-unit of vegetable black water color, as sold in a collapsible tube, these being well mixed after the containing pot has been warmed in the water bath for a few minutes. A rather stiff, flat brush, a string or wire across the mouth of the pot for striking off any excess from the brush, and a larger pot to cover the whole closely, complete the equipment for backing, but a cover plate for the backing is desirable. This at best is a plate of matted black glass, with corner-pieces of thickish microscopic cover glass, cemented on with Canada balsam, to prevent contact and inconvenient adhesion, but an old negative with four corner-pieces of thick paper gummed on is a substitute. Obviously only one sensitive plate can be used in an ordinary double back under these circumstances, but two sensitive plates may be used in the double slide if a thin sheet of black celluloid is laid on the adhesive backing of each plate and the two celluloid backs are placed together in the slide.

A note on the thin black, flat celluloid, a remarkably useful material in the photographic work-place. Thin celluloid is stained, first green with an alcoholic solution of acid green, then red with an alcoholic solution of magenta, in such ratio as to produce the best of all blacks, a mixed black. After washing in water to remove any soluble remainder of either color, the celluloid is ironed flat between sheets of stout paper.

A very small quantity of the backing is

required if the layer is uniform, say, 4 grains for a quarter-plate, and it is seldom or never desirable to apply the backing quite up to the edges of the plate.

Ordinarily the protecting or covering celluloid should be peeled off before the plate is put into the developing solution, and it is more convenient to drop the plate through the developing solution than to put the plate in the dish first and then pour the developer on; as in this latter case the backing is so immediately and uniformly softened that a touch with the finger or a soft brush will clear a place at once, should back views or through viewing be desirable.

There is, however, one case in which it is desirable to leave the protecting celluloid on, or to use an adherent protecting plate at the back, that is to say, without the corner-pieces for giving distance. This is when the so-called "Aktinal" system of desensitizing and subsequent daylight development is adopted. In this case, the protecting plate or celluloid is of use in preventing the soiling of the desensitizing fluid (4 per cent. potassium iodide solution), which if thus protected may be used for several or many plates in succession.

The developer which I prefer to use, and one which I regard as a near approach to a universal developer, whether for plates or paper, is a rather strong hydroquinone developer with sodium sulphite and sodium carbonate:

Hydroquinone	45	grains
Cryst. sodium sulphite ..	2	ounces
Cryst. sodium carbonate .	2	ounces
Water	5½	ounces
(Total volume about 8 fluid ounces.)		

This keeps well, has a Watkins factor of about 5, and I have never found it necessary to add bromide excepting under conditions like those of the "Aktinal" process or the Player-type process; when the film contains two grades of material, each developable, but in different degrees.

Even those professional photographers whose activities may be wholly confined to the studio would do well to consider the service occasionally rendered by backing. The full lights and shades of a clear white dress cannot be rendered on an unbacked plate, and to copy an engineer's blue print is almost hopeless unless on a backed plate—which should also be orthochromatic.—Thomas Bolas in *The British Journal of Photography*.

A New Series of Photo-Sensitizing Dyes

A new type of photo-sensitizing dye having an absorption maximum near 7000 Angstrom and a sensitization maximum near 7400 Angstrom has been prepared in the Color Laboratory of the Bureau of Chemistry. These dyes are formed by the action of alcoholic alkali and formaldehyde (or chloroform) on the alkyl halides (or other quarternary addition compounds) of sufficiently pure lepidine and its homologs. Dyes of the same or similar type are produced under some circumstances in the absence of formaldehyde or chloroform. The name "kryptocyanine" is suggested for these dyes, the structure of which has been tentatively worked out.—*J. Am. Chem. Soc.*

Warm Tones with Colloid Silver

In *Photographische Rundschau*, Dr. Felix Formstecher has a paper on the production of prints in a range of warm colors by suitable (chemical) reduction of a silver chloride image. He recalls the process in which such results are obtained by restrained development of a gelatino-chloride emulsion and prescribes a method based on the conversion of a developed image into chloride and its subsequent exposure to light in presence of reducing agents appropriate to the production of tones ranging from blue to red chalk. The tones thus obtained are much more vivid in color than those resulting from the sulphide process and others dependent on the conversion of the silver image into a different metallic compound. The mixture found most suitable for the conversion of the developed image into chloride is:

Copper chloride	30 grams
Hydrochloric acid, sp. gr.	
1.17	3 c.c.s.
Ammonium persulphate...	10 grams
Water	1,000 c.c.s.

This causes the image to disappear completely, other bleachers, such as ferricyanide and mercuric chloride, leaving a faint visible residue. The print is washed for a few minutes, treated in one or other of the following baths, and exposed to light:

For red to yellow color:

Stannous chloride	10 grams
Hydrochloric acid, sp. gr.	
1.17	1 c.c.
Water	100 c.c.s.

The print should not be washed after exposure to light; the stannous salt may remain in it without ill effect.

For blue color a solution of hydrazine sulphate is used, but prints must be washed after immersion in it, otherwise they turn yellow.

Hydrazine sulphate	10 grams
Water	500 c.c.s.

Nitrite yields a color intermediate between those produced by the two foregoing baths:

Potass. nitrite	10 grams
Water	500 c.c.s.

Papers coated with unripened chloride emulsion are most susceptible to this process. Gaslight papers, as a rule, are more suitable than bromide, and yield good results, particularly with hydrazine and stannous chloride. With some chlorbromo paper the hydrazine is found to yield a remarkably bright color, but the print must not be left too long in the bath, otherwise the tone becomes degraded with black in time. Washing out the hydrazine sulphate scarcely affects the tone; and with some gaslight papers the process yields a violet blue tone scarcely obtainable in any other way. With stannous chloride, on the other hand, the tone is red-chalk, becoming brownish purple. Both tones are fairly permanent.

A necessary precaution in the use of the process is to avoid too strong a light when bleaching and treating in the subsequent bath. The prints should be handled and dried in a darkened room, and not exposed to bright light until dry. If so exposed whilst wet, spotted points with yellowed whites are obtained. The process leads to a certain loss of contrast, though this can be avoided by omitting the persulphate from the bleach, which then leaves a slight residual image. Dr. Formstecher does not anticipate extensive use of the process, owing to the time required for exposure, but puts it forward as the most convenient method for the special purpose of obtaining vivid tones. The process, of course, is not new (cp. Gamble and Woolley, *B. J.*, December 26, 1913, pp. 987-991), but the particular formulæ given above have their practical interest.—*B. J.*

Preservation of Developers in Solution

PRESERVATION has relation both to developer in stock solutions and developer during its action upon the plate at the evolution of the image.

In both these cases it is air which acts detrimentally, or, rather, the oxygen con-

tents of the atmosphere, and the exclusion is the problem presented.

The developing agents act by taking a portion of bromine from the silver bromide, which has been acted upon by the light on exposure.

Bromine is as ready to form combinations as to oxygen, and, as the function of the developer is to combine with the bromine, it must of necessity get hold of the oxygen.

During the process of development manipulation the preservative employed is sodium sulphite, because this lets the solution keep its alkalinity, which is necessary to the process of development.

When preservation of stock solutions of developer is the question, the same precaution respecting the exclusion of air is necessary; consequently, the less empty room for the entertainment of air, with its associate oxygen, the better; hence the advisability of putting up the stock solution in small bottles instead of in one large one, because every time portions are abstracted the more space for ingress of air. These bottles, of course, must be kept tightly corked.

The contents of small bottles may be apportioned for the quantity of solution needed.

This stock solution should be concentrated and acid, because in such a state it is not as greedy for the oxygen as in dilute condition.

The best acid to use is sulphurous acid, communicated by addition to the solution of an acid sulphite, and doubtless the best is sodium or potassium meta-bisulphite. If ordinary neutral sulphite is used it has to have also an acid with it. Sulphuric acid is sometimes used; indeed, most frequently. It acts, of course, in liberating sulphurous acid, but may also form sulphate, which is not well to have present in the developer. Citric acid is preferable, for even if it forms citrate this salt does no harm more than slowing down the action of the developer, which may even be an advantage.

Printing on Fabrics

VIGNETTES, or oval pictures upon silk, satin or linen fabric, may be made by the following method, which is quite inexpensive and preferable to the usual methods advocated.

The best quality of ribbon or other fabric must be used, and preferably such as is

without rib markings, for the object of getting the image flat upon the stuff.

Any color, not affected by the process, may be selected, but the effect is best upon white or cream color.

The fabric must first be put through a salting bath. The most satisfactory is that containing some resin, which gives a good surface for the print.

Alcohol	4 ozs.
Gum benzoïn.....	15 grs.
Mastive	10 grs.
Cadmium chloride.....	½ oz.

Dissolve the gum first, then add the cadmium chloride and filter, after letting it stand for a while.

The fabric is immersed in this solution for half a minute, placed for a moment between two clean blotters, to get rid of the surplus solution, then dried thoroughly and made smooth by ironing between clean blotters.

The sensitizing bath is made by dissolving 60 grains of Nitrate of Silver in one ounce of distilled water.

Immerse (under subdued light) the salted fabric in this solution for one minute, blot off again between clean blotters, and when dry, iron smooth with a moderately hot iron between paper of several folds.

Printing should be carried on much deeper than for P. O. P. The printing is done in an ordinary printing frame, and the print may be examined from time to time to note progress.

A good plan is to attach the fabric to a slip of thin card by gumming the ends to the back.

This affords a substantial foundation for the fabric and keeps it from shifting about.

When printed to the right degree, the image is washed in a warm bath containing a little borax, which eliminates the gum sizing. Wash for about ten minutes in several changes of water.

The image may be toned, if desired, by means of the following toning bath:

Sodium bicarbonate.....	10 grs.
Water	10 ozs.

When dissolved, add one grain of gold chloride. Keep the fabric in motion while toning, to insure uniformity of tone.

When toned, wash well for fifteen or twenty minutes and fix in hypo 1 part, water 4 parts. Dry and iron out smoothly between blotters.

These printed fabrics can be employed for making a variety of fancy articles, book markers, bags, pin-cushions, etc.

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THE FOREGROUND IN PICTORIAL COMPOSITION—WILLIAM S. DAVIS

THE foreground constitutes an important element in the majority of subjects possessing depth or perspective, whether it forms the principal feature or not. In many instances, of course, the point of interest is located in a nearby plane, but even though the objective point lies beyond this the near portions are important, since their character affects the design of the composition as a whole, and not infrequently certain tones and lines in the foreground serves to strengthen the result.

To avoid confusion we will consider the use of foreground material for a complete picture separately from its utilization as part of a more open scene, since in the first instance near parts are of paramount importance, while in the second they should occupy a subordinate or contributory place in the composition.

Taking first the possibilities when interest centers in the foreground.

One feature soon noticed when dealing with near objects is that a slight change of viewpoint, either horizontal or vertical, affects strongly the line and tonal grouping, the difference of even a few inches often producing a striking variation in the effect. Owing to this, and the profusion of fine detail so often present, considerable care is required to secure a harmonious pattern of lines and masses, but this is both interesting and instructive exercise, affording a good test of one's ability to grasp the pictorial essence in the subject-matter.

The range of subjects which lend themselves to foreground compositions is almost unlimited, a few which immediately come to mind being plant groups, tall grasses, the spreading roots and base of an interesting shaped tree, the

pattern of sunshine and shadow over snow and other surfaces, reflections and strong bits of architecture.

In selecting the viewpoint two things should be kept in mind—viz., the arrangement of the material to form an agreeable "pattern" composed of the varied tones, and avoidance of distracting elements in the distance which serves as a background. Detail usually is an important element in objects seen at close range, but this should not be allowed to interfere with the general breadth of light and shade in the composition as a whole. To secure unity of effect in this regard it is well to first observe the pattern produced by the larger masses of light and dark tone, or if such are not present try to find the reason, which in some instances is due to their being broken up by minor details which are made too prominent by the way the subject is lighted. Even though a great amount of detail exists, and is shown in the finished picture, a sense of harmony can be preserved if this is not so sharp in contrast as to jump out from the larger areas or tone masses of which it should form an integral part. The only parts where detail may take precedence over masses is in some note of accent or a small object in which the interest centers.

Making minor details subordinate in the larger tonal spots is to a great extent a question of securing suitable lighting, both in strength of illumination and the angle from which it strikes the subject. Specific instructions for obtaining this quality cannot be given because no two subjects are exactly alike in character; therefore, each have to be dealt with individually. Broadly speaking, however, it is safe to say reducing the intensity of illumination also reduces the range of contrast, and by softening the many little catch lights reflected by projecting details cause these to fall back into the general masses to which they belong. For this reason a subject in which minor details have a tendency to obtrude themselves under strong lighting can often be photographed most advantageously on a grey day, or when the sun is hidden by light clouds, providing, of course, cast shadows are not an essential feature of the composition. Another way, which flattens the tonality of the shadow portions and gives sparkle in the light passages, is to work with the sun in front of the camera, thus bringing the shadow side of all objects which rise vertically toward the lens. This also affords an excellent means of making the most of cast shadows in the composition, especially during the early morning or late afternoon, when the sun is low. Take care, however, under such conditions not to allow the sun to shine directly into the lens, which should be shaded, preferably by a well-fitted lens hood.

The most important quality to look for in the background is unobtrusiveness, and as a rule this is most often found when it approximates to a flat tone in harmony with the subject. Open sky or a surface of quiet water is excellent as a setting when the foreground is not too dark. An open field or hillside, when not too sharply focused, usually presents a flat or softly graded tint of somewhat stronger tone. The shadows under a mass of thick foliage sometimes produce a good dark background to some part which is well lighted. An atmosphere filled with fog or mist is a great help when a



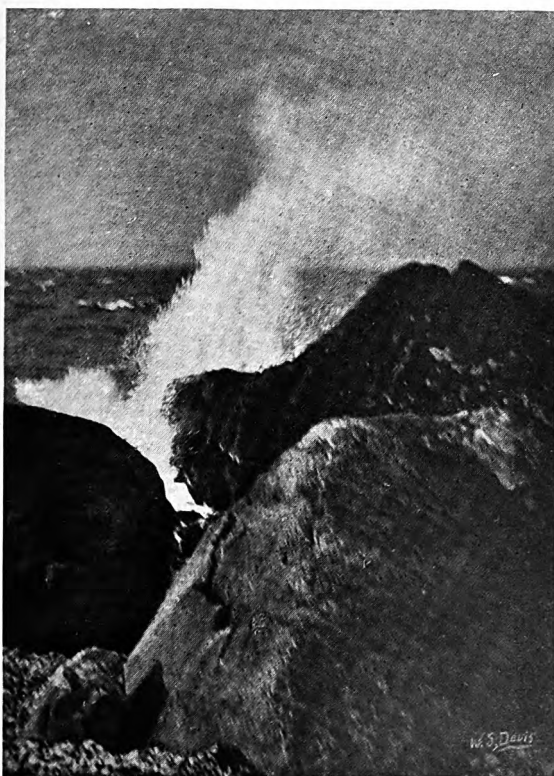
"GETCHENS." GEORGE H. SUDDARD

simple background cannot be secured otherwise, as it produces just the soft vague quality so much desired and also separates near parts from all others in tone.

Some differentiation in focus is helpful in defining different planes, but to secure just the quality desired in the lens-image with ease and certainty the camera should be used on a tripod and the effect of focusing and different sized lens apertures studied by visual observation on the focusing-screen.

The exposure should be longer upon near objects than for an open view, from two to four times more under similar conditions of lighting being a fair estimate, except when a large expanse of very light tone nearly fills the picture. Usually the general depth of tone is heavier in the foreground than elsewhere, and the amount of less actinic color greater, both of which factors must be taken into consideration. It is always best to use a color-sensitive emulsion, and often a superior rendering can only be had by employing a ray-filter as well, the latter being essential for good results when strongly contrasting colors are present.

Coming now to those compositions wherein the foreground plays an accessory role, the problem is to make the latter helpful without introducing



"DASHING SPRAY." WILLIAM S. DAVIS

dual points of interest. One way, although a negative one, when any choice exists is to have the foreground so bare and monotonous that the eye is obliged to turn toward some other part to find subject-matter of interest. In a few cases this method works out all right, especially as a means of accenting the detail in the middle-distance, but in general to do this is to sacrifice the possibilities of increasing the beauty of the composition as a whole by means of the right kind of strong foreground.

Among the uses to which foreground material can be put is increasing the feeling of aerial perspective by massing the deeper tones in this part, since the natural tendency of atmosphere is to lighten tone as parts recede from the observer, and this characteristic quality being associated with open scenes a similar feeling can be produced by taking care to so arrange the subject-matter that this shall be emphasized. To do this without making the foreground detail obtrusive the material should either be naturally bold and simple in character or else thrown into shadow to prevent the details attracting too much attention.

The lines formed by near parts, such as the curve of a beach, road or winding stream, and the strong lines in an architectural subject, when pro-



"MELTING SNOW." WILLIAM S. DAVIS

jected in the right direction, lead the eye into the picture. Lines and masses also furnish a most valuable means of balancing other parts removed from the foreground.

Our illustrations were chosen to bring out more clearly some of the leading points mentioned.

"The Old Cedar Tree" and "Melting Snow" are both exclusively foreground compositions, no objects beyond the immediate foreground being visible in either. It will be seen that "pattern" is the dominant element in the cedar tree study, which is practically a flat tonal design. Delicate detail, produced by the rough surface of the snow and the dried grasses is an essential part of the snow picture, since much of the charm of a subject of this kind depends upon the quality of surface texture, but this is secondary to the broad effect created by the large areas of snow and sky accented by the dark tones of the exposed portions of the embankment.

"Dashing Spray" is essentially a foreground study, inasmuch as most of the material and the interest is concentrated upon the near planes, but in this case the tones of the distant water and sky are of considerable importance, being essential to balance the rocks and spray, and convey the feeling of space which the character of the subject demands.

In "The Shadowed Highway" the group of wayside trees in the middle-distance dominates the composition, making the foreground an accessory element, but the shadows in the latter are of much value, as they balance the dark tones in the foliage, increase perspective and break up what would have otherwise been an expanse of roadway made conspicuous by its flat, empty appearance.



"THE SHADOWED HIGHWAY." WILLIAM S. DAVIS

SOME POINTS OF CONSIDERATION IN MAKING PICTURES OF INTERIORS

THE writing of the following observations on photographs of interiors is prompted from an examination of a series of very excellent technical views by the camera, which, despite their evidence of skill, did not altogether please the eye; the cause of this unusual appearance only becoming manifest by a critical study of the work.

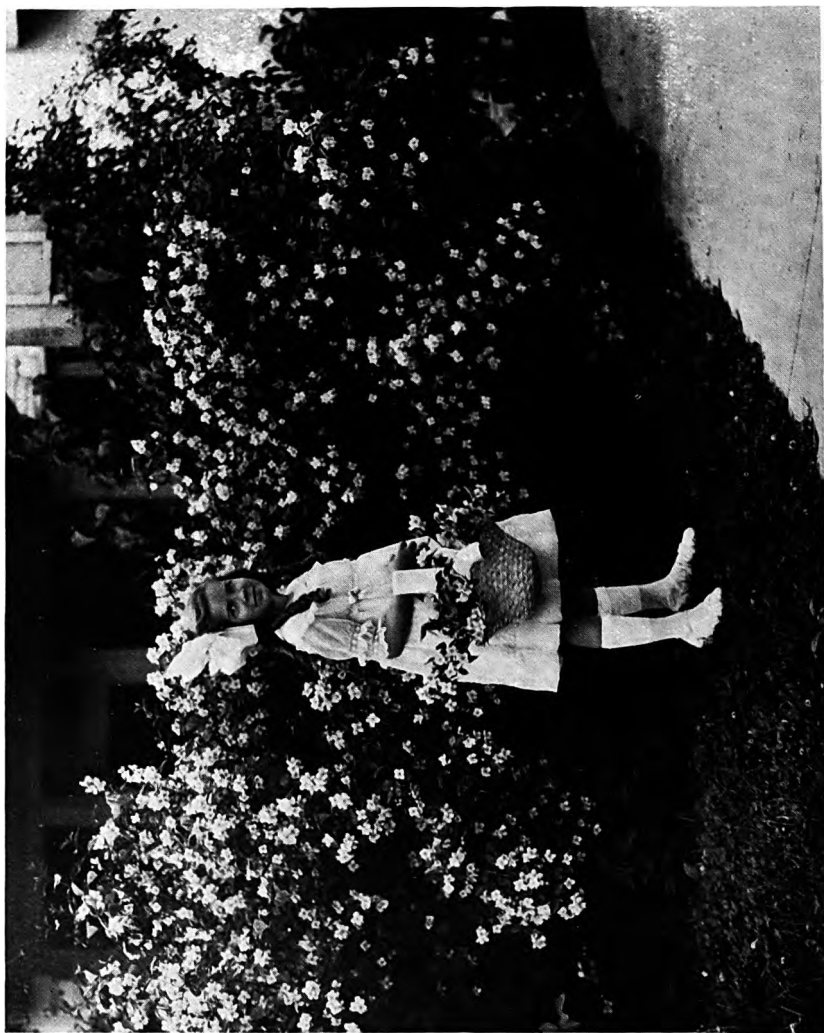
It was found to be a case of exaggerated perspective, which, though optically and geometrically true, was false to normal vision, or rather, we should say, contrary to what the eye is accustomed to contemplate from its assumed point of view.

You know it is a contention of some that all views should be studied from the same range as that at which they were taken. Now this is fallacious in anyone to maintain that a picture is ever made under such imposed conditions in the contemplation of it. The visual distance varies within very small limits.

But leaving this question of angular presentation aside, there is danger



"THE OLD CEDAR TREE." WILLIAM S. DAVIS



"THE FLOWER GIRL." BEN. V. MATTHEWS

of misrepresentation of the interior view and want of apparent truth in the picture incident upon the placing of the vanishing points in the perspective.

Even painters, who have come to understand the value of the camera for quickly furnishing them with the perspective of a room which they could properly secure only by patient geometric drawing, sometimes too implicitly accept the perspective the lens gives and disregard the point of view from which the subject was made.

In looking back to the pictures by the early painters, just after the discovery of the mathematical principles of perspective drawing, we note how some of them, in their enthusiasm to exhibit their newly acquired knowledge, overdid the performance and made some queer looking things which could be justified only in the way the present sticklers for wide angle and oblique perspective maintain the right of their contention for the verity of the production.

Now, in the pictures we were examining, there is just the fault we wish to point out for your edification. In these interiors we see the point of distance chosen, so that one of the vanishing points is within the picture.

That is, the rectangle of the room is shown obliquely to the plane of the picture, so that at once, to the eye, there seems something untrue about it.

Now, all pictorial perspectives should be so managed as not only to *be* true but also to *look* true.

Hogarth was a genius at delineation, no doubt of it (read what Charles Lamb says about his wonderful pictures), but in his picture in the "Idle Apprentice" series, in which the apprentice is seen taken into custody, the ceiling of the Night Cellar is a glaring example of false perspective, arising from the placing of the vanishing point of the beams within the composition.

This is not the only instance of this artist's carelessness, who thought it worth the trouble to publish a print in which he points out the gross errors consequent upon ignorance or carelessness in perspectives.

This is no place to criticize Hogarth, even if we had the ability. We would rather point out the taste he shows in his marvelous composition, but we have to say some of his interiors would look better had he regarded the effect of the vanishing points; for in one in particular, the breakfast scene in "Marriage a la Mode" the distortion is painfully manifest. Neither the floor nor the ceiling appears level, unless (like the wide angle devotee says), we place the eye so close to the picture as will interfere with the distinct seeing of it.

This may be a case where Hogarth wanted to show his skill in perspective, but we wish he had not.

The Dutch painters manage better their interesting interiors, having the perspective under control of good taste.

It is not at all incumbent on the artist-photographer to be able to execute mechanical drawings to scale. Of course, it would train his eye to observation of perspective. The lens does the drawing, and he has to take what it gives, but then he can select or adapt the view so as to materially modify

what the lens perspective presents. One way, as we have shown, is in preferring parallel to oblique perspective.

The plane of the picture itself is subject to the laws of perspective and becomes altered, more or less, in shape according to the point from which we view it, and carries with it all the lines on the surface which are parallel with or perpendicular to the horizon, just as it appears to our normal vision and just as a proper focus-corresponding lens would show. But we have to say certain interiors constrain the use of a lens not always suitable for pictorial presentation.

There is little or no trouble encountered in views of great interiors like the "Congressional Library," and we can choose the lens most suitable; but when we have to take small living-rooms we are sometimes put to our wit's end.

There is no offspace for the camera with the long focus. The chairs, stools, etc., near the camera, show up disproportionally big, and things only a trifle further away are inordinately dwarfed.

The floor, too, seems to be going up hill. It does not calm us to be told this is geometrically correct and that the view should be looked on at the proper distance.

The best advice is: Do not select such subjects for pictorial rendition, but if they have to be made and you are desirous of getting as near normal looking as possible, use, first of all, the narrowest angle applicable and get as far back as possible, and remove from proximity to the lens anything in the room, and do not fear to have the picture somewhat bare in the foreground. Place the camera rather low, somewhat below the level of the eye.

PRODUCTION OF COLOR BY ALTERATIONS OF BLACK AND WHITE

THE interest in anything pertaining to reproduction of color by physical or chemical manipulation calls for whatever may possibly advance our knowledge in relation thereto.

We have not seen any recent reference to the subject here presented and so think it may be desirable to those experimenting in this particular direction.

About fifty years ago experiments were started which showed that visual color sensation could be produced by rapid alternation of black and white, but no really practical method was devised to demonstrate the varied colored effects which can be obtained in this way.

It is only about a few years back that Mr. Manly Miles again took up the problem and produced by this method the colors of the spectrum. A brief review of some of the established facts of the physiological behaviour of vision, however, is necessary to get comprehension of this method so as to understand how the color phenomena are brought about.

We have to remind you that the undulations or waves of the ether fall-

ing upon the retina produce impressions conveyed by the optic nerve to the brain, which are recognized as light sensations.

By means of the glass prism, or the ruled grating, a compound ray of white light is resolved into its components and shown to consist of a number of rays, each having a particular wave length which, transmitted to the retina, produces a distinct color on the spectrum in a definite order, from red to violet.

The range in length of these ether waves which are thus made visible varies. The outlying waves are more numerous than those visible, and furthermore, the eye is limited in its perception of rays at either end—being confined to perception from waves longer than those of the visible red, or shorter than those of the visible violet or lavender.

All these sensations of color are, therefore, purely subjective phenomena, mental interpretations of movement of various velocity. The waves of the ether sent out by the sun are recognized as the chief source of light, but are not manifest to our intelligence as light until they break against the minute particles of matter suspended in the earth's atmosphere. Inter-planetary space is, therefore, in total darkness, though the waves are there.

A sunbeam admitted through an aperture into a dark room shows itself in a bright straight band where it strikes the particles of dust floating in the air of the room.

Tyndall showed that when this suspended matter is removed the path of the entering sunbeam is invisible, because nothing is there to intercept the bombardment.

It goes without saying, therefore, that the apparent color of natural objects depends upon their property of transmitting to the eye impressions equivalent to those produced by definite wave lengths of the ether.

We must not, however, assume that the sensation of a particular color is an indication that a wave of the ether of a definite length has been impressed upon the eye, as will appear from the effect produced by mixing certain colors.

A blending of red and yellow, for example, results in the sensation of another color, orange, but it does not follow that the combination of these two colors of different wave lengths can possibly give an intermediate wave length characteristic of spectrum orange.

The effect produced is purely subjective brought about by peculiar physiological means—the combined ether waves of red and yellow affect the orange sensation by a sort of nervous selective action, which coincides with the impression from the pure orange of the spectrum.

Any object which gives out rays which are recognizable as representing a particular color may be subjected to conditions which modify the impressions received from it by the eye, and this changes the apparent color.

A grating of fine lines closely ruled or a peculiar distribution of minute particles of matter interposed, or even the motion of the object itself, may bring about this result, and a satisfactory solution of the problem in color

photography must be sought in lines of research, relating to these physical and physiological reactions.

About fifteen years back Mr. Miles Manly took up the problem where it had been left off and succeeded in producing the spectrum colors from black and white. His experiments seem to have been overlooked or disregarded by the investigators of color photography. After numerous attempts he found that the best and simplest method of getting the colors from rapid alternations of black and white is to revolve disks of white and black paper with lines symmetrically ruled thereon. The disks used were from three to ten inches in diameter. Two disks, one black and the other white, are made of the same size, with a central hole in each to fit on a peg forming the axis of rotation of a whirling table.

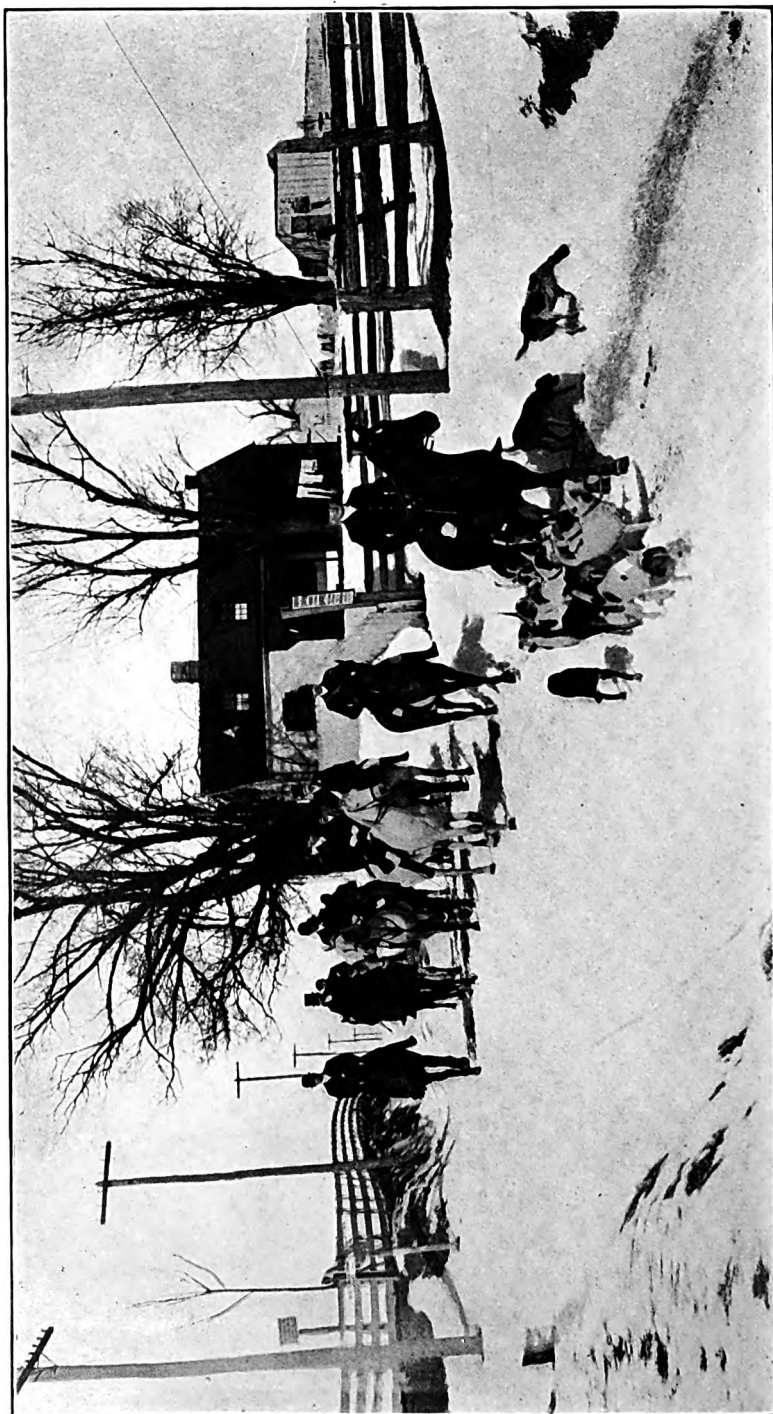
A series of concentric circles are drawn on the white disk in India ink by means of a ruling pen and compass from a center, which is approximately from one-twentieth to one-tenth of an inch from the center of revolution.

These lines may be from one-third to one-half an inch or more apart. A radial slit is then made from the circumference to the hole in the middle of each of the disks, so that they can be interlocked and placed upon the whirling table together and the relative proportions of the black and white in the combined disk readily adjusted.

When thus properly adjusted and put in motion, bright lines and bands of color appear, which, under favorable conditions, are as bright and distinct as the colors of a spectrum with an ordinary glass prism.



"TREE SWALLOWS." VERDI BURTCH



"THE HUNT." WILLIAM N. JENNINGS

The colors produced and their intensity will vary with the relative proportion of the black and white of the disks exposed, which can be readily adjusted, and with the character or quality of the light the speed of rotation and the thickness of the lines in relation to the space between them.

A different adjustment of the disks will be required with light from different sources and of different intensity. When the rotation of the disks is reversed the order of colors is inverted and the shades of the colors changed.

A black disk, ruled with white lines and interlocked with a plain white disk, gives complimentary colors. For this purpose black cardboard, ruled with flake-white paint mixed with turpentine to give the proper consistency to flow from the pen, has been found most satisfactory.

Some of the most striking effects have been obtained with a black disk ruled with white lines interlocked with a white disk ruled with black lines, and in their adjustment to vary the relative proportions of black and white a variety of color effects may be produced. Aside from the blending or alternations of black and white the character of the surface of the disks, not perceptible to the unaided senses, seems to have some influence on the colors produced.

Mr. Manly suggests that a solution of quinine, brushed over the disks before ruling, increases the intensity of the colors toward the violet end. Almost an infinite variety of color effect may be produced with these disks by varying the conditions of their adjustment and rotation.

The black and white of the disks cannot be changed by the motion to which they are subjected. They are still free from objective color and remain the same as when at rest. The colors perceived must, therefore, be attributed to the rapid alternation of black and white, which produces the same impression upon the eye as the definite waves of ether which characterize the particular colors observed, as in the case of artificial mixture of colors.

Those who are experimenting in the production of color cinematographing by mechanical devices might derive some hints from this subject of the physiological effect produced by rapid alternation of black and white.

FULL-LENGTH PORTRAITS

THE single head or bust picture is the most usual form of portraiture, but occasionally, one is treated to an excellent full length. The reason for the less frequency of this style is probably due to the difficulty the artist experiences in managing the composition, for, where more than the head is included, factors present themselves which are not easy of artistic solution. The arms and the hands, for instance, and the legs where men are photographed.

The distinguished portrait painters seem to relish the difficulty thus presented, as giving opportunity for exercise of their talent. The older photographers can remember when the *carte de visite* style of picture was in vogue, when the figure was exhibited in a 3 x 4 form entire.

We smile at this relic of a past taste, where some of our revered ancestors

are seen standing with all the dignity the occasion demanded, leaning against a doric pillar, in a pair of wide angle pantaloons or capacious crinoline. Of course, our artistic age repudiates such presentations, and we prefer what is called three-quarter views.

Even the painter finds difficulty in giving dignity and look of ease to poses where the feet are included, unless young children are the subject, and so they make use of any arrangement to carry off the attention from such parts, when the task is imposed upon them.

The photographer, however, tries to avoid such pictures on account of the necessity imposed upon him by photographic exigencies; that is, for one thing, the difficulty of disposing all parts as nearly as possible in the same plane.

At the revival of painting, in the 14th century, we find painters venturing the fore-shortening of figures, and though their zeal to exploit their efficiency in the new phase sometimes led them into exaggeration, they demonstrated the value of showing certain parts of the figure in a natural and unconstrained manner.

No doubt the restrictions imposed by lens-perspective deprives the photographers of this benefit which the painter has, of showing in his picture the arms and lower limbs extending forward or receding.

Most anyone who tries his hand at photographing a piece of sculpture or a seated statue appreciates the artistic limitations imposed by the point of view. What a bother it is to avoid exaggeration in the perspective! This, the painter does not encounter, because he is allowed to give in his picture the mental, not the physical, impression the spectator has of such a subject.

Our eye perspective is really akin to that of the lens, but we know the figure does not possess distortion, and we mentally correct our eye view of it.

The photographer, therefore, is debarred from making any of those beautiful arrangements of circular compositions which the painter gives us.

Effects in line can be had only at the expense of technique, and so the generous critic sometimes makes allowance for the falling-off by the photographer in photographic technique.

In poses where two-thirds or more of the figure is represented, introduction of background accessories is often helpful.

An interest is thus given to parts which draw attention from that in the picture which the artist does not desire to call notice to.

Portraits of men in full length introduce the objectionable legs clad in cylindrical pantaloons, but fortunately men prefer dark clothing, and hence the columns are not as self-assertive as they would be if in high-light. It is best, even though the pantaloons are dark, to keep the picture in this region still darker.

One never minds in a well-done three-quarter portrait the slighting in expression of the lower part of the portrait, whether it be of man or woman.

With women it is much easier to get pleasing results, without particular depression, on account of the greater variety of interest possible by disposition of the dress and drapery, consistent with the pose.

We have noted that in the standing full lengths, the figure presents a more graceful appearance than when the subject is taken seated.

In a chair the model is apt to loll, and even if a suggestion of this undesirable presentation is made, you are liable to get instead of a pleasant repose, one which exhibits constraint and self consciousness.

Grace, the essential element, in a single full length, is secured by a proper reversing of the action of the various parts—sometimes, by turning the head just a trifle in a different direction from that of the body, and varying the lines of the limbs. Angularity must be scrupulously avoided.

Study from the drawing of figure painters, and you will learn how skillfully they vary the position of the different members of the body so as to avoid perpendiculars and unpleasant sharp angles.

BREADTH AND DIFFUSION OF FOCUS

THE contention of the pictorialist that sharpness of focus in a photograph, with the attendant minutiae of detail, is inimical to breadth of expression in the picture, has some validity, but it does not warrant the assumption that breadth and presentation of detail are irreconcilable.

The exponents of photo-impression aver that their purpose in recourse to diffusion, or softening the planes of the picture, is to secure breadth.

The object is laudable and there is no disputing that, thereby, they often succeed admirably; but at the same time we confess the means applied betrays often a straining of it to force it to do something which can be better performed by legitimate artistic methods, and if so, wherefore the necessity of insisting upon diffusion as the only resource?

Understand, therefore, we are not denying the contention, but simply repudiate the pronouncement that breadth and sharpness are incompatibles, and at the same time maintain that the much-desired pictorial feature is better secured by management of the light than by degradation of planes of distinctness, because we can practically substantiate our assertion by ocular demonstration, by pointing to many a picture by distinguished painters (Titian, to go no further) which have intense sharpness in parts and at the same time wonderful beauty of effect, due to "breadth."

And further, we might refer to photographic pictures made in the reign of universal sharpness, which also have this delightful characteristic.

In a good picture, where there is this breadth with sharpness, the spectator is never irritated by the expression of minutæ, rather does it particularly charm by its strange subtle quietness.

But undoubtedly we discover, by study of such pictures, that the "breadth" is not due solely and singly to mere expression of detail. There is something in conjunction. What is it?

Now, we advise, get this breadth, even though you have recourse to degradation methods, for it is nearer to natural pictorial vision than hard definition, but if you can get it more effectively with the exercise of artistic

skill rather than mere mechanical subterfuge, is it not more honorable, more justifiable in support of the contention of photographic art and the possibility of the presence of the individual factor, the personal equation in photographic expression?

We know, then, that it is possible, by management of the illumination, to get breadth without recourse to mechanical device.

The light may be so managed as to reduce the distinctness in certain parts of the subject; that is, to make such parts seem to have less minutiae, less definition, make, in other words, the parts less obtrusive.

Suppose we arrange the model in the portraiture so that the drapery is just dimly visible, hardly distinguishable, except by close scrutiny of its texture from the background itself, and at the same time arrange that the face is brought out clearly and distinctly.

We have not degraded anything; really there is a natural sharpness all over. The minutiae is only visually optically suppressed, not by diffusing the focus or using a lense with spherical or chromatic aberration.

We get it by legitimate natural means, by judicious modulation of light—by proper exposure and conscientious rational development.

Moreover, we avoid spottiness, which is so apt to present its appearance in the employment of any mechanical device.

The photographer must be ever alert to appreciate this breadth, with its attendant softness and elimination of spottiness in areas, by cultivating his eye to beautiful effects, secured by the method of illumination and only have re-focus or using a lens with spherical or chromatic aberration.

INFLUENCE OF NEUTRALIZER ON TONE OF PRINT

EVERY practitioner who appreciates the character of the tone of the print finds it important to consider the behavior of the substance employed in neutralizing the gold content. Many factors influence the color of silver and gold precipitates.

In order to pass correct judgment upon the nature of the gold precipitate, it is necessary to know something about the physical condition of the substances employed.

The thickness of the film, whether the deposit is of metallic silver or whether, as maintained by some physicists, as only a subchloride of silver, has been found to have influence upon the result in the tone of the print.

Chemical action exercises a great influence upon the generation of various tones of the silver image.

When bromide and chloride of silver films are exposed for a brief time only to light and the image brought forth by subsequent development, the tones produced are grey or black-grey.

Chloride of silver gelatine films, when exposed for a limited time to light

and then developed by special developers, yield images of reddish or orange color, the reason of which is that the presence of an organic substance (gelatine) determines a deposit of a reddish-brown tint.

The tones of the reduced silver will vary in the fixing bath between a tan, rusty brown and grey, accordingly as the image is a directly printed-out one or a developed one.

If a subsequent tone is effected, it is found that light tones are intensified. But it is also true that the gold will act upon black tones and modify them.

The brighter the tone of the original the more brilliant will be the resultant tone.

The chemical process taking place during gold toning is probably as follows: The reduced silver salt image, metallic silver, subbromide, subchloride, or whatever else it may be, after the light has had its influence upon it, is there subject to the attack from the gold or the gold from an attack from it.

The gold salt employed in toning is a solution of ter-chloride of gold (auric chloride). It is necessary to make the gold salt neutral or slightly alkaline to effect toning.

The gold is accordingly mixed with such substances as will effect the neutral condition, such as borax, sodium carbonate, sodium phosphate or acetate, etc.

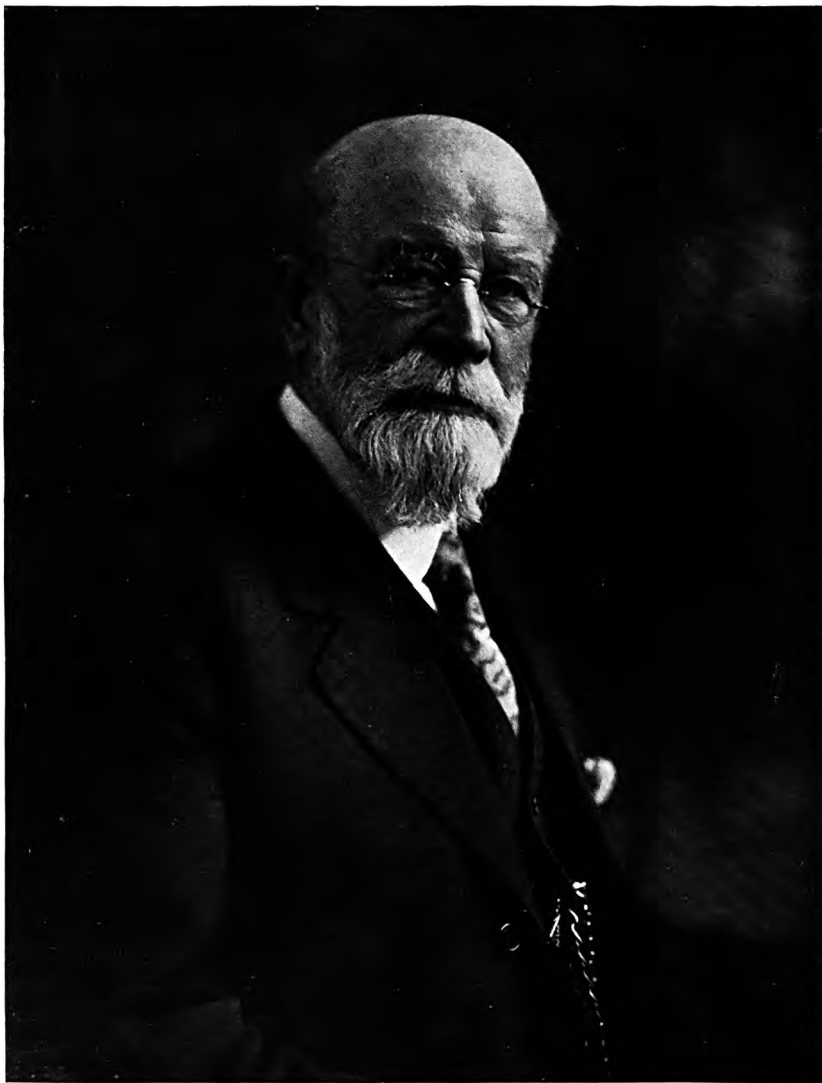
Gold salts are readily reduced, and so are easily precipitated, thrown down in the metallic form by various organic and inorganic agents. The toning bath may, therefore, be looked upon as a solution containing a potential deposit of gold supply ready to be handed over to the receiver—the silver—on the silver giving good credentials or chemically ready to precipitate the gold on any suitable reducing surface which it comes in contact with.

The reduced silver salt, forming the image, acts as receiver and appropriates the gold which the toning bath hands over. The parts of the film, not acted on by the light, cannot identify themselves, and the payment of the gold is accordingly not made there.

According to the length of time the proof is submitted to the action of the gold toning bath, the concentration of that bath and its temperature, the more perfect the transmutation and the resultant beauty of tone. Hence the importance of properly controlling the content of gold to do effective work; that is, the avoidance of exhaustion of gold in the bath by making the bath do overwork, or suffering a lowering of practical working temperature.

Alkaline baths tone with more rapidity than neutral ones, but this is not always desirable, and besides such baths do not keep well and there is a tendency to cold tones. Warmer and richer tones are had by slower toning process.

Acetate and tungstate of soda are generally employed as neutralizing agents in the toning bath, because rich tones are easier obtained thereby; but the photographer should know what tone he desires and not trust to getting it by application of any one toning bath. The relation of depth of printing to the toning must also be taken into consideration.



THE LATE L. F. HAMMER, OF ST. LOUIS, MO.

Died May 8th, 1921.

Aged 87 years.

The
**PHOTOGRAPHIC
 JOURNAL
 OF AMERICA**

TRADE-MARK REGISTERED

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Death of Mr. Ludwig F. Hammer

We regret to announce the death of Mr. Ludwig F. Hammer, president of the Hammer Dry Plate Company, in St. Louis, on Sunday morning, May 8th, aged 87 years. He died of a complication of diseases, following three weeks' illness at his home.

Mr. Hammer was a native of Germany, and came to America in the early fifties. After remaining in Canada for a few years, he came to the United States and finally located in St. Louis, some sixty years ago. Shortly after the Civil War he opened a studio on South Broadway, which he successfully operated for thirty years. In 1890 he sold his studio to his son, the late L. F. Hammer, Jr., and founded the Hammer Dry Plate Co., of which he was elected president and manager, and under the able and conservative management of Mr. Hammer, the Hammer Dry Plate Company established a large and increasing business. At the time of his death he was serving his thirtieth term as president of the company. Until his recent illness, Mr. Hammer had been in active charge of the business.

Mr. Hammer was a Mason for over fifty-four years; director in the Lafayette South-side Bank, and a number of other corporations and organizations.

Mr. Hammer's wife died in 1907. He is survived by three sons, four daughters and one sister, who is now 82 years of age.

Mr. Hammer was one of the most lovable men we have ever met, and his loss will be felt by his many friends the world over.

Photography's Three-Fold Estate

Photography is justified in having upon its banner a three-fold blazon, the insignia of Science, Mechanics and Art.

The scientific phase is based on chemistry, physics and mathematics—the mechanical on craftsmanship and the artistic on the application of rules and principles of art in the control of the other two phases.

It is of importance, if it may not be essential, to the photographer to know the constituent elements of the various materials employed, the chemical and molecular activities under the influences to which they are exposed, and the no less and determinate reactions with known properties of matter and by the law of vision.

It is not too much to say that, without some attention to, or knowledge of facts, relations and behavior, no man should lay claim to the title "photographer."

But the artistic phase is the dominant one, dealing with each of the other estates, standing as a mediator between the two, and yet, all the time, influenced by both.

Now, while the scientific and mechanical divisions are by their nature exact, determinate, unalterable, the artistic is essentially variable, indeterminate, and altogether dependent on the immediate conditions of action and emergency of the instant.

But it is, by reason of this very inexactitude or inconstancy attendant the art phase, that photography claims the right of recognition as a means of artistic reproduction, and justifies the assumption by the photographer to the title of artist.

The popular notion of "art" is something which is not dependent upon rules and principles, something which, like poetry, cannot be communicated.

But while admitting the validity of the contention for inspiration, art is, in a certain sense, skill, knack, acquired ability.

An "artist's made as well as born."

However, it is easier to point out what art does, than to try to explain what it is.

Its possession implies not merely knowledge, as derived from examples and precedents, but that peculiar kind of intelligence which is creative and suggestive.

In comparing art with nature, we are apt to underrate art, in the same way that in considering art, by itself, we are disposed to elevate it unduly: both propensities standing in the way of our improvement.

The axiom, that the most perfect art is that in which the art by which it is effected is concealed, is directed, more against the ostentatious display of the means employed in production, than to any belief, that art is a matter of happy chance or possession of extraordinary gifts, rendering study and labor unnecessary.

On the contrary, the enjoyment of a picture is always more in proportion as the spectator discovers the why and the wherefore of its excellence; that is, the intellectual pleasure it affords.

Now, we must not understand that the concealment of his art in the making of his picture implies that the artist intends to pass his work off as independent of imitation or as a reality, because we would then miss, immediately, what we never miss in a truly fine picture—motion. If the suggestion of movement in the picture were such as to deceive, that instant we would have arrested movement, petrification at one phase of movement, like we have in wax-work art, which has all the externalities of life to perfection but for that very reason it is the most lifeless presentation.

Grain of the Negative

It has been shown by Schumann that the grain of the finished, developed negative does not necessarily resemble the grain of the original silver bromide film, and that the presence of potassium bromide in the developer has a marked effect in producing coarseness or granularity of the film of the negative, directly proportionate to the quantity of the bromide present.

But besides this well-known action of potassium bromide, another marked effect, which Schumann was the first to observe or make mention of, is the increase of contrast. He assumes that in this action, some of the silver bromide is dissolved in the potassium bromide and that the developer reduces this dissolved silver salt, and that the nascent metallic silver is precipitated, according to the physical development of the silver grains, of which the image is formed.

R. E. Liesegang, who agrees with Schumann, further suggests that during the coarsening of the grain, the potassium bromide retards the development very much, and that the grain, under the prolonged influence of the alkali in the developer, grows like that of a finished negative which is subjected to warmth, while still in a moist condition.

Woman's Auxiliary at the P. A. of A. Convention

Preparations for the comfort of those who will attend the coming International Convention at Buffalo during the week of July 18th to 23d, are practically complete and many things will be done for your welfare that have never been attempted at previous conventions. As an example, on the opening day a regular get-together luncheon will be served, with business suspended during that time, so that everybody may get acquainted. We've seen the menu and you couldn't get such service for less than about 65 cents—yet you'll only have to pay a dime for it. And then there will be a carnival idea with it. It promises to be a great innovation.

The Woman's Auxiliary of the P. A. of A. will look out for you and we are printing a letter that they have just sent out—but that tells the story itself, so here it is:

"This year the Woman's Auxiliary of the P. A. of A., is planning great things. We have been organized for only two years, so have not had much opportunity to be useful to the Board. But this year we are to help entertain the ladies attending the National Convention, so that no man can go away and say truthfully that 'taking the wife to the convention was an interference'; or, 'if I had not had the Mrs. to look out for, I could have seen how to develop that new paper all the boys are using.' No, indeed! This year friend wife is to be very busy, as she is to meet the dealers' and manufacturers' wives, and the wives of all the photographers, and all the ladies attending the convention; in fact, she is to act as hostess, as the Auxiliary is to have headquarters right inside the hall—a nice place to rest and visit. Each day, ladies from different sections are to act as hostesses. Don't you like this idea?

"Then, we are to have a lovely 'tea garden'—where tea is to be served every afternoon, free. The ladies are also to have charge of this—and act as hostesses, so you see we need you.

"It is a little early to plan your vacation, but I know you have been thinking about it; but wherever you have planned to go this year, do go by way of Buffalo and make it in time for the National Convention, July 18th to 23d.

"We will have reduced railroad fares to Buffalo. Buy a one-way ticket and ask the ticket agent for a certificate for the P. A. of A.; then when you return home,

the certificate is honored by the railroads and you pay only half fare. It is important that you ask for the certificate.

"The Board this year has promised the members the best convention ever held, and from plans already far advanced, I know it will be. There are so many new things a man cannot afford to miss. Just one of the many things they are to see this year is a simple process to save the silver from discarded developer. Do you know that each year your expenses to the convention could be saved from what is dumped down the sink?

"Have a talk with friend husband today, and tell him what I have told you; get him interested enough to send in his membership dues, if he has not already done so.

"If this part is settled, please drop me a card, telling me you will be in Buffalo, so that I may place you on a committee where you can help us put the Woman's Auxiliary on record this year as a big success of the National Convention.

"Thank you for giving me so much of your valuable time, and I do hope we shall meet this year in Buffalo.

"BERTHA E. TOWLES,
"Chairman."

Brooklyn Institute at The Camera Club

At The Camera Club, New York, from May 1 to May 31, 1921, there was held an exhibition of artistic photography comprising the work of the Brooklyn Institute of Arts and Sciences, Photographic Department.

The exhibit consisted of 93 prints and included thirteen processes, as follows: Artatone, 2; Bromide, 5; Bromoil, 29; Bromoil transfer, 1; Carbon, 1; Chloride, 1; Gum, 12; Gum Palladium, 2; Gum Platinum, 3; Kallotype, 1; Kerotype transfer, 1; Platinum, 23; Platinum (hand coated), 12.

The exhibition was inaugurated by a lecture on *Aéro Photography* by Col. Eduard J. Steichen, to which were invited the memberships of the Institute's Photographic Department, the Orange and Newark, N. J., Camera Clubs and the Pictorial Photographers of America, and many representatives of each of these organizations filled the spacious exhibition rooms.

The display was unusually fine, embracing many prints previously shown at salons in this country, Canada and abroad. Much of the work manifested a high degree of technical skill and quality, and many examples included excellent art features.

To mention a few of the best:

"In York County," "Sunshine and Shadow" and "The Bridge," by William E. Macnaughtan; "The Birches," by Robert B. Montgomery; "My Father," "The Patriarch" and "The Rag Rug," by Vernon E. Duroe; "Park Row on a Wet Day," "A Lonely Vigil" and "In the Fog," by William Alexander Alcock; "An Indian Maid," "Ella" and "Marjorie," by Miss Sophie Lauffer; "Doris," by H. A. Neuman; "High Tide at Manursing," by Samuel Holden; "High Seas," by Joseph Petrocelli; "Cathedral Arches," by Richard M. Coit; "Portrait," "Evening" and "Channel Workers," by Jamees M. Edsall; "Municipal Building and City Hall," by Mrs. Antoinette B. Herve; "A Thorn in the Foot" and "Joy," by Meyers R. Jones, and "The Birch," by Harry B. Fischer.

A very interesting attraction was an exhibit of one dozen prints by Charles B. Denny of subjects and designs made with dolls, entitled "Adventure of John and Susie." This feature was, in many respects, unique.—*Floyd Vail, F.R.P.S.*

Miss Hewitt on Alaska

At The Camera Club, New York, on May 17, 1921, a rare treat was afforded the members, the occasion being a lanternslide lecture on "Alaska" by the eminent traveler and explorer, Miss Virginia Hewitt.

This talented and courageous lady has made several journeys through Alaska, traveling thousands of miles, and penetrating regions seldom or never explored heretofore. Being a photographer of unusual skill, she availed herself of her talent to secure views of scenes out of the ordinary, and which included by color the expression of the atmosphere and seasonal variations and, as a climax, specimens of some of the gorgeous sunsets that prevail in that country. Therefore, the lecture was not only entertaining and instructive, but was besides appreciated for its photographic features.

F. J. Mortimer's Prints at The Camera Club

At The Camera Club, 121 West 68th Street, New York, during June and July, will be exhibited the work of F. J. Mortimer, F. R. P. S., of London, England. Mr. Mortimer, we consider, is one of the most artistic workers of the day, and his marines particularly appeal to us—in fact, he is a worker strictly in an individual class.

The exhibition is free and may be viewed daily from 10 A. M. to 9 P. M.

Will the Wet-plate Come Back

Attention has been called in several issues of *THE PHOTOGRAPHIC JOURNAL OF AMERICA*, to the fact that owing to the very high price of glass in Germany, a paper substitute has been, with apparent success, placed on the market. An editorial in a recent issue of *Das Atelier* discusses the possibility of a return to wet-plate work along certain lines. It is pointed out that the modern lenses are so rapid that it may be possible to use them with the wet-plate and get pictures by much shorter exposure than was possible in former years. The plan, of course, includes the cleaning of the negative after the prints have been made, but this seems to be impracticable in a large number of cases, inasmuch, in studio work, a considerable part of the photographer's revenue depends on the ability to furnish additional copies. It is, however, true that along some lines the negative is of minor value. There is no question that the wet-process has some advantages. It is much cheaper, and the complication of developers is avoided. The old acid-iron developer was so easy to make and so cheap, and then the developed plate, after brief rinsing, could be taken out into the light without risk and immersed in the fixing bath. The dry-plate requirement that the fixing bath is to be kept in the dark-room was a shock to those who had been brought up on the other method. Cleaning the glass plate was, of course, some bother, but, on the other hand, negatives that were failures or no longer wanted could be brought back to usefulness. Cleaning agents, by the way, are now available which render the process very simple and satisfactory. In the olden days, it now and then happened that, by imperfect cleanings, a faint repetition of the former picture would appear in the second development, although to all ordinary inspection the glass was free from any remains of the first material. Some of the "spirit" pictures were made in this way. From this experience it would seem that the latent image is in part on the glass. We know from the method of developing after fixing that the image may be in the gelatin.

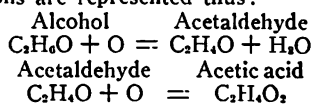
The German editor overlooks one serious difficulty in substituting wet plates for dry, namely that all modern plate-holders are only adapted to the latter form. The old wet-plate holder had glass corners, which are absolutely necessary to prevent staining. Possibly the old photographic establishments have some of these appliances but

should wet-plate work ever come in to active use, the manufacture of such holders will be at once possible. Then will come to the amateur photographer some new troubles, and he, or she, will make acquaintance with oyster-shell stains and developer halo. One of the makers of lantern slides in Philadelphia uses the wet-plate process exclusively, and in the hands of expert workers, the wet-plate slide is very satisfactory. The mass of amateurs will find the present dry-plate and roll-film methods so satisfactory that there seems to be no likelihood of any general return to the methods of our fathers in photography.

The Persulphate Reducer

Considerable discussion is now being had in the journals concerning the properties and actions of this agent. The introduction of it is due to the Lumières, who, in 1898, brought to the attention of the French Society of Photography, the details of the procedure, the paper being published in the *Journal of the Society* for that year, and subsequent communications in 1899. Lately, the firm A. & L. Lumière and Seyewetz have been re-investigating the subject, and a further study of it has been made by Higson, whose communication appears in the current issue of *The Photographic Journal*. Higson's article, which is a report of work done in the *British Photographic Research Association's Laboratory*, is a very comprehensive review of both the history and bibliography, and shows that the greater part of the literature is in languages other than English, hence, as he suggests, the intricate phases of the action are not so well understood by English-speaking workers.

Persulphates belong to the class of substances termed "oxidizers," having high power of either adding oxygen to other substances or (which is, in many respects, an equivalent action) taking away positive elements, especially hydrogen. Thus, the conversion of alcohol into acetaldehyde by the action of chromic acid, and a subsequent conversion of this aldehyde into acetic acid are both termed "oxidations" although in the first change no oxygen is added. The reactions are represented thus:



In the first, hydrogen is removed but no oxygen added; in the second, oxygen is

added and the atoms of hydrogen undisturbed. It is, however, to be noted that when alcohol is converted into the aldehyde the *relative proportion* of the oxygen to the whole molecule is increased, and thus the procedure is substantially an oxidation. Oxygen constitutes about 35 per cent. of the weight of alcohol and about 36 per cent. of that of the aldehyde. Substances that take away oxygen or add positive elements, especially hydrogen, are termed by chemists "reducers," a use of the word that conflicts with its use by photographers. The addition of hydrogen to acetaldehyde, by which it is converted into alcohol is a reducing action, although it is brought about by substances having an action opposite to that produced by the persulphate.

Much discussion has been held in regard to the manner of action of the persulphate. The Lumières advanced a theory when the matter was first brought out, but this has been strongly challenged. Higson reviews in considerable detail the conflicting views. At the time that the Lumières proposed the persulphate, in the form of the ammonium salt, it was already known to photographers under the name "Anthion" (*i. e.*, against sulphur) for removing the last traces of hypo from the film.

The discussion as to the manner of action of the persulphate has waxed rather warm at times, in fact, in the issue of *The Photographic Journal* containing Higson's paper, a letter appears from Sheppard, of Rochester, N. Y., challenging the accuracy of a translation of a statement that appeared as an abstract in *The Photographic Journal*, but the editor thereof quotes the French text which justifies the rendering. Sheppard's view is that the slight traces of iron salts, present in commercial persulphates, have a decided action in determining the effect of the reducer, ascribing this effect to a catalytic action. Lumière Brothers and Seyewetz assert that by repeated recrystallizations all traces of iron can be removed from the commercial salt and the action is the same if the solution has the proper acidity. The theories are too abstruse for discussion in this abstract, but a few points that have been brought out by the extensive experimenting may be indicated.

The addition of a silver salt to the solution increases the activity, as does any substance having the power to dissolve silver chloride, bromide or iodide.

The addition of acid greatly accelerates

the action; it is not absolutely necessary, as reduction has been obtained in alkaline solution, but very slowly.

The potassium salt is as efficient as the ammonium salt. The latter has been most used probably because cheaper, but the potassium salt of the market is a purer product.

No other reducing agent acts in quite the same way as the persulphates.

The Silver Bromide Grain of Photographic Emulsions No. 1. By A. P. H. Trivelli and S. E. Sheppard. Illustrated. Price, \$2.50. Eastman Kodak Co., Rochester, N. Y., and D. Van Nostrand Co., New York.

This work is intended only for those interested in the scientific phase of photography and consequently is confined to theoretical disquisition and of no special value to photographers who exploit photography as a business or agreeable recreation.

The monograph is confined to investigation of the nature and behavior of the silver grain constituting the emulsion and takes up the influence exercised on the emulsion by subjection to the influence of ammonia vapor, and theory of ripening.

The experiments show that there is no ammonia development of the latent image, properly speaking, but only ammonia development of the visible image, that actual development is rather to be explained by simple recrystallization effect, not involving directly any Ostwald ripening, that the development or ripening of nuclei is due to photo chemical decomposition products of the silver colloid to silver halide.

VonWeimarn's theory is discussed and additions made to it by the authors, and determination of the *grain* size of precipitates in relation to their theory.

Accessory factors influencing the dispersity of silver bromide emulsions—the effect of colloidal media, the effects of mixture of silver halides and introduction of soluble ingredients other than silver halides are also discussed.

Crystalline catalysis forms a most interesting chapter, as well as the phenomena of capillarity and crystalline growth.

There are other chapters on the experimental study of the crystallization of the silver bromide with elucidating diagrams of much interest.

The whole work furnishes valuable reading for the scientific photographer.

Steichen at the Camera Club

Col. Eduard J. Steichen, the eminent pictorialist and, during the Great War, Chief of the Photographic Section United States Air Service and Chairman of the Inter-Allied Aërial Photographic Section, on May 3, 1921, delivered a lecture before The Camera Club, New York, on "Aëreo Photography." This was illustrated with slides made during the war by Col. Steichen and his contingent, which were most remarkable, not only because of the subjects presented and their renderings, but the circumstances and difficulties under which they were taken. These disclosed many facts heretofore unknown by most people or even imagined. So intricate were some of them that they could not have been understood but for the speaker's very clear explanations.

Col. Steichen's lecture was full of information and most entertaining, and it was greatly enjoyed and praised by an audience that filled the club's assembly rooms.

Col. Steichen has lately had conferred on him the rank of *Chevalier de Légion d'Honneur* by the French Government.

Revival of Stereoscopy

Our French exchanges seem to indicate a revival in France of interest in stereoscopic pictures. There is a "Stereo-Club" in Paris, and a recent issue of the *Photo-Revue* contains about a dozen advertisements of cameras adapted to the taking of such views, and also of apparatus for viewing them. About fifty years ago there was a great vogue of this amusement. A parlor was hardly considered as completely furnished without a stereoscope and a collection of pictures. A great variety of scenes, natural and posed, was available. Some views were made on glass; some very pretty transparent views were made in Paris on thin paper backed by tissue on which appropriate coloring was painted, so as to give an effective imitation of natural scenes. As the stereoscope passed out of popularity, the "Graphoscope" came in for a short reign. This was a large, long-focus convex lens, with which a single picture, about 4x5, was viewed, giving some appearance of solidity. All these forms of apparatus went out of vogue, and with the *carte de visite*, tin-type and family photograph album, have long been consigned to the limbo of the garret or loft.

Much attention has been given to obtain-

ing appearance of solidity on the screen. It is well known that the general effect of perspective is due to the concordant action of the two eyes, by which a picture from two points of view are fused in the perception, and it is obvious that a picture on a flat screen having no actual solidity, can hardly be expected to develop such a phase by any means. A sort of false solidity has been secured by methods, which, though highly interesting from a scientific point of view and quite ingenious, are essentially impracticable for a general audience, since they require that each person shall be provided with a special viewing apparatus.

Some approach to an appearance of solidity can be obtained when a very bright view is thrown on a screen in a well-darkened room. The vividness of the picture impresses the eye strongly and the well lighted portions stand out in such strong contrast as to seem to be in relief. While the problem of producing true relief effects on the screen seems to be unsolvable, it must not be forgotten that an eminent American photographer once pronounced impossible the taking of photographs in natural colors, and that Lord Kelvin and Professor Simon Newcomb both said that it was impossible to make a heavier than air machine rise and fly by power produced in its own structure, both of which problems are now solved.—H. L.

Prints Produced by Mercurous Nitrate

FROM time to time attempts have been made to produce a sensitive surface for printing by use of some salt of mercury.

Quite early in the practice of photography attention was attracted to mercury because of its susceptibility to influence of light.

Robert Hunt, in the "Researches on Light" (1839), calls attention to the action of light on several combinations of mercury, and John Herschell, in 1840, gives a process for printing which he declared produced more beautiful results than silver (at that time); but the method was troublesome and uncertain, and the prints could not be made immune to further action of the light (could not be fixed, as we say). Nothing more was done with mercury as a medium for printing until recently. It, however, plays an important part in photographic manipulation, as is well known for intensification of the silver image.

Sometime ago M. Namias worked out a successful method with the use of the mer-

curous nitrate, which is worthy the attention of the practical photographer on account of the good character of the print and its probability of permanence.

Mercurous nitrate may be had of the chemist and it is advisable to purchase it rather than to make it, which, however, is easy of accomplishment, but bear in mind all mercury compounds are poisonous by reason of the propensity to accumulate in the system by absorption through the cuticle.

The following is the method for making mercurous nitrate:

Pour a couple of pounds of washed mercury (metal) in a clean tray (porcelain or glass). Washed mercury means metallic mercury strained through a piece of chamois. Let the mercury lie flat in the tray and pour upon it sufficient nitric acid to cover it to the depth of about three-eighths of an inch (commercial acid will do). Action soon begins—more rapidly if the tray is kept slightly warm. Only a small quantity forms at a time upon the surface in the shape of crystals, which must be scraped off with a glass strip and dried spontaneously upon a clean blotter. In the same way treat the subsequent formation of the crystals. Now to make the sensitizing solution. Take of this—

Mercurous nitrate..... $\frac{1}{2}$ ounce
Water 5 ounces

Add slowly just sufficient pure nitric acid to redissolve the precipitate on adding the water to the crystals of the nitrate.

The operation is best performed in a stoppered jar, shaking the bottle with each addition of the nitric acid.

A hand-sized paper is best for coating. Sensitize by floating for three minutes on the solution (by gas or weak daylight).

Exposure takes from three to five minutes under a normal negative. The paper does not keep well, hence it is best to use it freshly made and to be sure that it is perfectly dry.

DEVELOPER

Ferrous sulphate (green vitriol), (pure clean crystals) 1 ounce
Tartaric acid 1 ounce
Water 35 ounces

Do not agitate the tray during development. A grayish image is formed. Rinse off and fix in—

Common salt 2 ounces
Water 20 ounces
Five minutes is sufficient to fix and

twenty minutes or half an hour for the washing.

This image is strengthened to a beautiful platinum like black, which is permanent, by toning in—

Platinum chloriplatinite .. 7 grains
Tartaric acid 140 grains
Distilled water 35 ounces

The resemblance to platinum prints is striking. It is comparatively cheap, easy of manipulation, but we caution again about its poisonous character and to keep hands as much as possible from contact with the solution of mercury.



An X-Ray Portrait

This is a photograph of H. L. Mencken, the well-known critic and editor of *Smart Set*, believed to be the first use of the Roentgen rays for portraiture.

The X-ray plate was hung at the level of the subject's head, and he stood in front of it, facing it squarely, but with his head turned at right angles. The exposure was then made in the usual manner. After the X-ray plate (life-size) was developed, it was carefully reduced outside the area of the bones, to bring out the flesh values. Then an ordinary print was made and this was rephotographed on an 8x10 plate. From this plate the prints are made.

The subject stood with his back toward the X-ray machine during the exposure.

Full-face exposures turned out to be unsuccessful. The bones of the head obscured the teeth, etc.

The Bromoil Process

A recent issue of the *Bulletin* of the Belgian Photographic Association contains an abridged translation of papers by Professor R. Namias in "Il Progresso Fotografico" on recent improvements made by him in the technique of the Bromoil process. Signor Namias repeats the bleach formula which he has found satisfactory, viz.:

Copper sulphate cryst. ...	10 grams
Potass. bromide	8 grams
Chromic acid, pure cryst. ...	1 gram
Water	1,000 c.c.s.

As regards inks, their composition should be solely of lithographic varnish, pigment and dammar resin. An ink of this kind, softened, if need be, by means of a little litho varnish, allows of excellent results, provided that a paper of good quality is used. As the ink keeps well only in a sealed metal tube, it is convenient to make it up of a somewhat greater degree of fluidity for convenient filling of the tubes. This may be done by adding a volatile solvent, such as essence of turpentine, toluene or benzene. In this case, after the ink has been spread on the palette, sufficient time should be allowed for the solvent to evaporate completely. Turpentine requires about half an hour; benzene or toluene only a few minutes.

The qualities emphasized by Namias for a bromide paper for Bromoil printing are: (1) Hard and well-sized paper base. (2) Emulsion rich in silver and gelatine, and somewhat thickly coated. (3) No hardening substances to be introduced in manufacture, and (4) opacity of the sensitive film. According to Namias, the bromide paper which best fulfills these conditions is that issued as *Bromoil* by Messrs. Illingworth.

For swelling, Namias describes a new method yielding better results than the ordinary process. It consists in subjecting the paper to the action of water, so that only the gelatine film is wetted. The print is secured to a sheet of glass by means of a 10 per cent. gelatine solution, or with a mixture of one part commercial fish-glue and five parts of water, to which is added, after the glue has been allowed to stand for some hours in the water and then dissolved by the aid of heat, 300 c.c.s. of denatured alcohol. The mixture should be cooled before the alcohol is added, but the adhesive is warmed on a water bath immediately before use.

The bleached, fixed and washed Bromoil print is made surface-dry with filter paper, and the back then coated with the 10 per cent. gelatine solution or with the above fish-glue mixture, the print being fixed to a slightly larger sheet of glass and left to dry. When dry it is swollen in the usual way or by means of the following mixture, such as is employed in collotype:

Water	100 c.c.s.
Glycerine	100 c.c.s.
Ammonia	4 to 10 c.c.s.

The advantage of this bath is that the gelatine film does not dry during inking. After inking, the glass plate, with the inked print attached to it, has only to be immersed for a short time in cold or tepid water in order to remove the print.—B. J.

How to Reduce Contrast in Bromide Prints and Enlargements

AT one time or another we have all had negatives which will give a good print on P. O. P., but which are too hard and contrasty to yield a good print on bromide. For various reasons we have not wished to alter the negative in any way, and are, therefore, in somewhat of a quandary as to what is to be done.

I have noticed during the course of various experiments that if a bleached negative is redeveloped, the redevelopment takes place evenly all over the surface, and gradually penetrates downward into the film until the whole of the silver has been reduced, when the image will, under normal circumstances, be the same as it was before.

I concluded, therefore, that if I applied this method to bromide prints and stopped the development by fixing in hypo before the dark parts of the picture had been fully developed, the contrast would be reduced proportionately.

In actual practice, though at first the action of the redeveloper appeared to be even all over the print, this was not quite the case; the action of the developer slightly increased in rapidity as the deposit of silver was greater.

In order to test this method I made a series of prints from the same negative, giving them all the same exposure and developing for the same length of time, so that all these prints were identical. The high-lights and half-tones were correct, and the dark tones were too dark. These black and white prints were fixed, washed and dried.

No. 1 print was kept as a standard, and the remainder were bleached. Now bleaching transforms the silver image into a bromide of silver which is soluble in hypo. No. 2 print was bleached and redeveloped for twenty-two seconds in a normal developer, at which stage the desired contrasts were obtained. It was then fixed to eliminate any unreduced silver bromide which might remain. The developer appeared to act too quickly for accurate control. I therefore made the following experiments in order to find a suitable strength for the developer, and also in view of noting what difference there might be in the subsequent toning to which they were to be subjected later.

No. 3 was bleached and redeveloped for thirty-two seconds in developer 3 parts, and water 1 part, at which stage the contrast was the same as No. 2.

No. 4 was bleached and redeveloped for forty-seven seconds in equal parts water and developer. Contrast, same as Nos. 2 and 3.

No. 5 was bleached and redeveloped for two minutes seventeen seconds in developer 1 part, water 3 parts. Same contrast as others.

It is to be noted that as each print reached the desired density it was fixed.

I now wished to ascertain if by entirely redeveloping a bleached print the density would be the same as our No. 1 standard print.

No. 6 was developed through with normal developer, and No. 7 with developer 1 part, and water 3 parts. They gave the same result as No. 1 print.

No. 8 print was redeveloped in the same solution as No. 5, *i. e.*, developer 1 part, water 3 parts, but for one minute forty-two seconds instead of two minutes seventeen seconds. The half-tones were the same as Nos. 2, 3, 4 and 5, but the shadows much lighter. Up to this stage all the prints are in black and white, Nos. 1, 6 and 7 having too much contrast, and Nos. 2, 3, 4 and 5 having corrected contrast: No. 8 having less contrast. It now remained to be seen if the same relation would be maintained during the subsequent toning.

After being thoroughly washed to eliminate any trace of hypo the prints were again bleached in the ferricyanide-bromide solution, rinsed thoroughly, and then toned in the sodium sulphide solution until the action was complete.

The result was that Nos. 1, 6 and 7, though showing slightly less contrast than

they did in black and white, still showed too much contrast, and they were of a beautiful rich brown tone. No. 2 was slightly warmer in tone, and showed the same contrast as after redevelopment. Nos. 3, 4 and 5 showed less contrast respectively, as the developer had been weaker, and were more yellow in tone. No. 8, which had been redeveloped for a shorter time, was more raw sienna in tone, and showed less contrast than any of the others.

The half-tones and lighter tones remained the same in all the prints, and only the value of the darker tones had changed.

Nos. 2, 3, 4 and 5 showed good detail in the shadows, while in 1, 6 and 7 the shadows are buried. No. 8 shows a certain flatness and considerable loss of detail in the shadows owing to redevelopment being insufficient.

I conclude that with a given degree of contrast in the original print the final degree of contrast depends upon the amount of redevelopment. The length of time for redevelopment for a given degree of contrast will depend upon the strength of the redeveloper.

The color of the toned print will depend upon the depth to which the redevelopment has been carried. The background of the picture upon which I was experimenting was somewhat blotchy, and I felt that its elimination or partial elimination might be advantageous. This can be done equally well after the first bleaching, or at any time during the redevelopment provided the redevelopment is temporarily arrested. When this picture was bleached for the second time previous to toning I rinsed it well under the tap, then blotted off the superfluous moisture, and then with a stiffish sable paint brush which had been dipped in hypo I painted carefully round the outline of the figure and all over the background. I then rinsed the picture well under the tap in such a way that the water flowed outward in all directions, and then proceeded with the toning as usual. The strong background had disappeared, and given place to a slightly yellowish one which harmonized well with the brown tones of the picture. The following is a resumé of the process. The temperature of the solution was 65° F. throughout.

1. Bleach in ferricyanide-bromide solution.

2. Wash for ten minutes.

3. Redevelop with metol-hydroquinone diluted according to circumstances until the required contrast is obtained.

4. Fix without washing five to ten minutes.
5. Thoroughly wash. The print may now be dried if so desired.
6. Bleach in ferricyanide-bromide solution.
7. Rinse thoroughly for a few minutes.
8. Tone in sulphide solution.
9. Wash finally fifteen minutes in changes of water, and finally dry. The following formulæ were used:

DEVELOPER

Metol	50 gr.	(3 gm.)
Hydroquinone	15 gr.	(1 gm.)
Sod. sulphide cryst.	500 gr.	(30 gm.)
Potass. bromide.....	10 gr.	(0.75 gm.)
Potass. carbonate....	100 gr.	(6 gm.)
Water	20 oz.	(500 c.c.)

This is the full strength and may be diluted as suggested.

STOCK

BLEACHING SOLUTION

Potass. ferricyanide.	400 gr.	(45 gm.)
Potass. bromide.....	600 gr.	(65 gm.)
Water to.....	10 oz.	(500 c.c.)

For use take:

Stock solutions.....	1 oz.	(50 c.c.)
Water to.....	10 oz.	(500 c.c.)

SULPHIDE TONING SOLUTION

STOCK SOLUTION

Sodium sulphide.....	1 oz.	(3 gm.)
Water to.....	10 oz.	(300 c.c.)

For use take:

Stock solution.....	½ oz.	(25 c.c.)
Water to.....	10 oz.	(500 c.c.)

B. J.

Mountants

MOUNTING is one of the most important parts of a photographer's work, and the mountant is the most important factor in mounting. Home-made mountants may be quite as satisfactory as some of the proprietary articles, and these notes have been penned for the benefit of those amateurs who wish to have a choice of formulæ when making up a mountant.

Briefly, a mountant should (1) be pure, this pre-supposing neither acidity nor alkalinity; (2) contain as little moisture as possible; (3) be permanent, *i.e.*, not liable to chemical change for a considerable period.

A number of formulæ for mountants which fulfill the requirements detailed above, in a greater or less degree, are given.

A.—The most widely used mountant of any perhaps is starch paste. A teaspoonful of crushed starch is placed in a cup and ground to a powder. Three spoonfuls of

cold water are then added and the whole worked to the consistency of thick cream, there being no lumps. Absolutely boiling water is added and the mixture stirred. On stirring, it will jellyfy; if it does not, it must be boiled, cooled, and the skin on the surface removed. The paste should be used cold, and when made, as it will not keep. The chief objection to this mountant is that it contains much water, and the result is that the mount buckles on drying.

The difficulty of buckling may be overcome to a certain extent by pasting on the back of the mount a piece of paper exactly similar to the print. The two pull against each other in drying, and the result is a flat mount.

B.—Gelatine	2 ounces
Water	12 ounces
Chloral hydrate.....	2 ounces

The gelatine is dissolved in the water by gentle heat, the chloral hydrate added, and the whole allowed to stand for a time. The adhesive is then made neutral by the addition of a sufficient quantity of sodium or potassium carbonate solution. Caustic soda or caustic potash would answer equally well. This formula again contains much water, and is not too satisfactory for that reason.

C.—Dextrine, best.....	3 ounces
Water	5 ounces
Oil of cloves.....	3 to 5 drops

The water is put in a vessel on a water bath and kept at 160° F., and the dextrine slowly stirred in until all is dissolved. The oil of cloves is added, stirring all the time, and the mixture allowed to cool. When cold it is poured into a bottle, corked, and set aside in a cool place for about ten days, when it will have congealed into a firm white paste. This keeps well and is less likely to cause cockling than some others.

D.—Shellac (unbleached)....	2 ounces
Methylated spirit, quantity sufficient	

The shellac is dissolved in the spirit (pure alcohol is better) to form a fairly thick fluid—the consistency of heavy cream. The fluid is thinly applied both to print and mount, and the two pressed quickly into contact. This mountant causes no cockling, and will keep indefinitely in a well-stoppered bottle, though the spirit will tend to evaporate in time.

E.—Pure gelatine.....	1 ounce
Water	4 ounces
Methylated spirit.....	1½ ounces
Glycerine	¼ ounce

The gelatine is softened in the water and then liquefied by gentle heat. The spirit

and glycerine are then added, a little at a time, with brisk stirring. This mountant is used hot, the mode of procedure being as follows. A piece of glass, slightly bigger than the print, is warmed to the temperature of the mountant, which is brushed thinly over it. The print is then pressed down on this glass face upwards, and, after having been in close contact all over, is transferred to the mount.—*Amateur Photographer and Photography.*

Preparation of Ray Filters

THE necessity of a properly constructed and properly adapted yellow screen in the practice of orthochromatic photography goes without saying.

There are most excellent appliances for this purpose upon the market, but even with this wealth of material for the unexperienced worker sufficient allowance is not made for the over-energy of the blue and violet, or else the correction is too great.

This is due to want of proper adaptability in reference to the character of a particular emulsion employed.

It follows, therefore, that one and the same screen is not adaptable to all conditions and that successful issue in the reproduction of a colored subject is the outcome only of successful adaptability of the screen to the nature of the color scheme.

Various filters of different degrees of absorption are a necessity.

Some information relative to the making of ray filters may be of use to those who wish to get the best possible results. Our formulæ are those of eminent experimenters in orthochromatic photography.

1. EDER'S AURANTUM COLLODION FILTER

0.3 grammes of aurantia are dissolved in 25 c.c. warm alcohol and filtered, and then added to 75 c.c.m. 2 per cent. raw collodion.

Well-cleaned plate glass (plate glass essential) is coated with this mixture in the usual way of a collodion plate; that is, so as to prevent wavy condition of the collodion over the surface of the plate. About 0.2 grammes of aurantia in 100 c.c.m. of collodion.

Dr. Vogel gives the following: Dissolve 5 grammes of auramin in 100 c.c.m. alcohol (absolute) filter, and then add to 30 c.c.m. of this solution 50 c.c.m. 4 per cent. raw collodion and 20 c.c.m. ether.

Andersen's formula is simpler because it employs gelatin instead of collodion.

The ordinary gelatine plate of commerce may be used, because, as a rule, it is upon glass which is flat. It is well, however, to examine the plate before treatment to see if it is level. The plate is first put in hypo bath (clean) 1 to 4, until the film is perfectly clear, then well washed to free from hypo and dried, then placed for five minutes in a cold saturate solution of auramin and washed. The longer the washing continues the less dense is the color, and so it is possible at once to make several grades of intensity.

If you find that the commercial plate is not perfectly flat, or that the cleaned film is not uniform throughout, you may make your own gelatine film.

Take a selected piece of plate glass, very clean, and flow it over with an 8 per cent. solution of pure colorless gelatine, let it dry and then immerse as above in the auramin.

Combined Development and Fixing

This method has lately been discussed in the PHOTOGRAPHIC JOURNAL OF AMERICA, on account of the interest aroused by recent communications from A. & L. Lumière and Seyewetz, giving new methods for the procedure. The main features are not new, having been occasionally mentioned in photographic literature for many years. The French firm has not only introduced new formulæ, but is now offering the chemicals in proper mixture as a commercial product. These are put up in glass tubes about four inches long and half an inch in diameter, well corked at each end. About a half inch of the tube is filled with a brown powder that is separated from the remainder of the contents by a close fitting plug of cork. Below this is about an inch of fine white powder and the rest of the tube is filled with a colorless crystalline material, probably hypo. The direction is to dissolve the contents of the tube in 100 c.c. (about 3 fl. oz.) of water. No statement is made as to the composition of the materials, the temperature of the bath, nor the keeping qualities. The solution is a dirty blue, nearly opaque except in thin layers. The materials mostly dissolve quickly, but a small portion remains for a few minutes. It is advisable to filter the liquid. Experiment with a couple of tubes showed that both development and fixing goes on, but the negatives were markedly veiled and the image not crisp. It is stated that the contents of one tube will suffice for about two 4x5 plates or

one 5x7. It has been suggested that the method might suit for tank development, but it seems that it will be much more expensive than the ordinary methods.

A note published in a recent issue of *Photo-Review*, in answer to an inquiry, gives the following formula for a combined procedure:

Water	100 parts
Sodium sulphite (dry) ..	5 "
Diaminophenol	1 "
Hypo	2 "

It is stated that development begins, after normal exposure, in about 20 seconds, and the whole operation is complete in 20 minutes, after which the plate may be washed in the light. *An experiment showed that after full 20 minutes, neither development nor fixing had occurred. It is, indeed, very unlikely that a 2% solution of hypo will fix an ordinary plate in 20 minutes.* In the procedure of *developing after fixing*, which is quite a different and more useful method, 2% hypo, which was the strength recommended by A. & L. Lumière and Seyewetz some years ago, was found to require about an hour to clear an ordinary plate, and it was also found that a 5% hypo can be used without preventing the subsequent development.

It is a question whether this combined procedure is of any practical value even if it is successful. If the chemicals can be furnished quite cheaply, and the action made to take place with regularity, it may, as noted above, be of some use in tank development, but it seems little more than a "stunt" in its present form.

Printing With Primuline

L. C. JOHNSON

COMPARATIVELY few photographic processes lend themselves to the production of prints on fabric; but that which is known as the "Primuline Process" is very applicable to silk, cotton, or similar materials. It is not so suitable for printing landscapes, portraits, or similar subjects; but for simple decorative designs with leaves, ferns and such like, the method can be used very effectively.

If a piece of silk or cotton is dyed with primuline, and is then immersed in a solution of sodium nitrate which has been acidified, a diazo compound is formed in the fibre. This compound is destroyed by the action of light, and also couples to form a range of colors when "developed" with suitable intermediates. If the dyed and

diazotized material is exposed (dry and flat) behind a pattern until those parts which are exposed have had their diazo compound destroyed, on developing we only get color in the parts which have been behind the pattern. By this means table-centers and other articles can be made.

The material having been cut to the required shape is dyed by immersing it in a solution of primuline of a strength of ten grains to the ounce of hot water, and boiling for a few minutes. It is then rinsed and put into a cold acidified nitrite solution, in which the yellow fabric will probably turn to a golden color. The nitrite solution may consist of twenty grains of ordinary commercial sodium nitrite (not nitrate) dissolved in ten ounces of water, one dram of hydrochloric acid being added when the nitrite has dissolved. The material after diazotizing should be pressed between blotting paper and dried in the dark, without using heat.

For printing, the pattern required should have been previously cut out or arranged as required. A few small strips of material should have been treated in the same way as the big piece to serve as exposure guides. When all is ready the exposure is made to daylight. Unless a large enough printing frame is at hand, it is convenient for large work to use a plain piece of glass. The pattern is put on the fabric and the glass is laid on the top, backing of cardboard being placed behind the sensitive material. The whole should be subjected to pressure to ensure as sharp a result as possible. The small pieces of fabric are exposed at the same time, and should be developed after successive periods to serve as a guide. I suggest for a bright clear day ten minutes as suitable intervals at which to remove the test pieces. The printing must be continued until no color is obtained on developing.

There are a great many developers which can be used in this process, amongst which are the following, all of which are to be used in an alkaline solution. Caustic soda or caustic potash can be used for this purpose, by dissolving the developer in water each ounce of which contains five grains of the caustic alkali.

Alpha naphthol	Purplish red
Meta-phenylene-diamine	Brown
Aminoazo benzene	Red
Naphthol A. S.	Brown
"R" salt	Orange

Of these I prefer alpha naphthol, be-

cause of the pleasing color which it gives. It is also easier to obtain than the others.

When the exposure is finished, the fabric has merely to be developed by placing it in a solution of one of these substances, and then rinsing it well. It can then be dried and ironed out, and the article is finished.

When the process was first published there was some hope of obtaining black or brown-black tones with it, so that it might be possible to use it for printing on paper or glass in the ordinary way. Eikonogen was suggested as the developer for such a color, but no such application was made. There is no reason, however, why for experimental purposes a sheet of glass covered with a film of gelatine should not be dyed with primuline, treated with nitrite as just described, and then printed and developed.—*The Amateur Photographer and Photography.*

Warm Tones for Stereoscopic Pictures and Lantern Slides

(*Photo-Revue*)

In a communication to the French Stereo Club, E. Vannier gives the following data: Pictures intended for projection or viewing in the stereoscope, are satisfactory only when possessing warm tones. To obtain such effects many toning solutions have been proposed. Some of these give blue or green tints, often interesting, but rarely of practical use, but, so far, it seems no one has formulated a toning solution that will enable the operator to run the whole gamut from black to red, comparable to the effect obtained on the special plates of silver bromo-chloride emulsion, designated warm tone plates. It is, therefore, not astonishing that the general run of photographers prefer such plates. The use of them, however, requires care. A slight error in exposure has a marked effect on the tone, and, indeed, red rather than black tones are often produced, which may have but little appropriateness to the original. Thus, a bright red tone may appear in a snow scene which is, of course, fatal. It does not seem necessary, however, to discontinue the use of these plates. The proper method is to seek to modify the undesirable tones. Efforts have been made to obtain red tones with plates naturally giving black ones; why not see if the reverse cannot be accomplished? Vannier says that he has found a sure method for this purpose and

presented at a recent meeting of the Club a series of views that excited much admiration for the range of tones from a cold black to a very warm one. The richness of the tones was not the least remarkable quality. He gives the following procedure which he applies to all positives of no matter what tone.

The plate is immersed in the following solution until it is entirely bleached:

Water	100 parts
Potassium bichromate	2 parts
Hydrochloric acid	2 parts

It is rinsed well, immersed for a few minutes in a 5 per cent solution of bisulphite to neutralize the traces of the bleaching solution, and then redeveloped in a suitable developer. Vannier recommends the following:

Water	100 parts
Sodium sulphite (dry).....	1½ parts
Diaminophenol (dianol)....	1 part

After development is completed, it is washed for fifteen minutes in running water.

A remarkable fact is that the image is not intensified, but the whites are cleared somewhat without the half tones suffering. The tones obtained depend on the time of immersion in the developer, but also to a considerable extent upon the composition of the same. A developer containing ammonia gives warmer and richer tones than one containing potassium carbonate. The above solutions will serve for treatment of several plates. All the operations described may be carried out in full daylight, so that the development of the image can be easily followed. By these methods plates of satisfactory tint can be obtained by everyone, and errors in first exposure and first development corrected.

The First Photographic Periodical

Il Corriere Fotografico, in a recent issue, presents some data in reference to the beginnings of photographic journalism, stating that the first publication of this type was "*Humphrey's Journal of the Daguerreotype and the Photographic Arts*," which was begun in New York City in 1846. While it is true that to the United States belongs the honor of initiating periodical literature specifically devoted to picture-making by light, the statement of the *Corriere* is not exactly correct. According to Bolton's catalog of scientific journals, the

first photographic journal was "*The Daguerreian*," which Humphrey began in 1851, and continued for several years, then changed its name to "*Humphrey's Journal of the Daguerreotype and the Photographic Arts*." It is curious to note that in 1847 a journal was started in Boston under the title "*The Daguerreotype*," but its subtitle describes it as a "magazine of foreign literature and science," from which it may be inferred that the art of picture making constituted no distinct feature of the publication. It lasted only a few years. In England, the "*Liverpool Journal of Photography*" began publication in 1854, and, after several changes of title, finally became the "*British Journal of Photography*," still in the vigor of life, and second to none in importance in the field. In France "*Le Photographe*" began in 1855. In Germany, the journalistic literature of the art and science of photography does not seem to have taken so early a start, for Bolton's list does not give anything earlier than the "*Photographisches Archiv*," which was begun by Paul Liesegang in 1860. Dr. Vogel, whose name is so intimately connected with the development of the theory and practice of color sensitization, started in 1864, "*Photographische Mittheilungen*," which was in 1912 merged with the "*Photographische Rundschau*," still one of the most important of the photographic journals of Central Europe. THE PHOTOGRAPHIC JOURNAL OF AMERICA, formerly the *Philadelphia Photographer*, and *Wilson's Photographic Magazine* was started in 1864 and published continuously.

Pinaflavol—A New Sensitizer for Green

Dr. E. Koenig communicates to *Photographische Rundschau* the account of a new color, termed "Pinaflavol," which belongs to a new group of basic colors, and was produced first by Dr. Robert Schuloff in the laboratory of the Hoechst color works. The colors of the group are yellow. Pinaflavol is decolorized by the stronger acids, but not by acetic. Dr. Eder writes to the editor of the *Rundschau*, saying, "In pinaflavol we have the long sought sensitizer for green rays, with the maximum influence about the line E of the Fraunhofer series, corresponding to a wave-length of 530 micro-microns, falling off markedly at D (the yellow sodium line), and extending in the other direction through F (in the blue). In contrast with the eosin dyes, the new one does not have

objectionable minimum of effect in the blue-green, but yields an unbroken, strong, defined band in the blue, green and violet." The sudden fall in effect at D is interesting. The practical relation of this is shown by the fact that in photographing a color chart with a medium yellow filter, the yellowish green is more obscured than the yellow. This is, indeed, no advantage with orthochromatic plates since, to the eye, yellow is brighter than green. For such plates, erythrosin, ethylred and pina-verdol are to be preferred. The advantage of the new color is all the more marked in the three-color process. Everyone with experience in this field knows that the making of the red block with the use of a green screen, requires a long exposure. The erythrosin or isocyanin plates, heretofore used in this procedure, show high sensibility to yellow and orange. It is, therefore, necessary to dull this sensibility with a green screen in order to bring out the green better, but in consequence of the blackishness of most of the common colors, the green screen absorbs much of the light and thus prolongs the exposure.

Pinaflavol, in consequence of its sensibility curve, facilitates the making of the red block with a yellow screen, which has the property of reducing the violet and blue. On account of the transparency of the yellow screen, the exposure may be reduced to half, an effect that is not only important to the photo-engraver, but also to those who are engaged in color photography in the open. The new color may be especially valuable in the development of the colored motion picture, an art still in its infancy, for a reduction of exposure is very acceptable in such work. Undoubtedly, the new color marks a distinct advance in the field of color photography.

The application of the color is made as follows: A stock solution, 1 part in 1,000 of water, is prepared, 1 part of this is diluted for use with 50 volumes of water and the plates bathed therein, either in darkness or by red light for a few minutes, well drained and dried. Dilute alcohol as a solvent, such as used in sensitizing with isocyanin, may also be used, but the plates are less sensitive than those in which the above formula is used. Pinaflavol is also applicable for sensitizing collodio-bromide emulsions. About 20 c.c. of a solution 1 part of the color in 1,000 parts of alcohol are added to 1,000 c.c. of the emulsion.

Development of Autochrom Plates

The usual method of developing Autochrom Plates is with either Metoquinone or Pyro.

The formulæ of these two developing agents call for 22°B Ammonia as the alkali. It so happens that very often one is placed in a position where it is not convenient to procure the correct strength of ammonia, or perhaps, the Metoquinone or Pyro are not handy.

Then again, the action of the Ammonia developers is sometimes inclined to produce a result which is rather flat in color on plates which are near or past the expiration date, or on those which might have been left in the plate holders too long.

The following method of development has produced excellent results on plates several months past the expiration date.

It has also been used to advantage on greatly over-exposed plates as development has been as short as 30 seconds on some plates without leaving the black cloudy effect which is produced by other developers on over-exposed and short developed Autochroms. On the other hand, development may be carried on for ten minutes if the plates are greatly under-exposed.

One point of importance in the use of Color Plates is to err on the side of over-exposure if there is any doubt. An over-exposed plate when sufficiently developed may appear thin, but can be brought back by intensification.

FIRST DEVELOPER

Water	1,000 c.c.....	32 ozs.
Methynol (or Metol) ..	5 grams.	75 grs.
Hydroquinone	10 grams.	150 grs.
Sodium sulphite (dry)	60 grams.	2 ozs.
Sodium carbonate	45 grams.	1½ ozs.
Potassium bromide ...	15 grams.	½ oz.

(10% Solution)

Use lukewarm water and dissolve the chemicals in succession, in the above order, not adding a chemical before the previous one is completely dissolved. Filter the solution when cold.

This is a colorless stock solution which keeps for months when preserved in a well-corked bottle. Dilute with equal volume of water.

The plates should be developed in this solution until the high-lights have turned black, and detail can be seen in the shadows when looking down on the plate in the developer.

A factor of 15 may be used, but it is safer to go by the appearance of the plate.

A good exposure will be completely developed in 1½ to 2 minutes. However, do not fear to cut or increase this time when necessary.

When development is completed, pour the developer back into a graduate, rinse the plate and pour on the Bichromate Reversing Solution, and take the plate to the light.

REVERSING SOLUTION

Water	1,000 c.c.....	35 ozs.
Potassium bichromate	2 grams.	30 grs.
Sulphuric acid (C.P.)	10 c.c.....	3 dms.

After 2½ to 3 minutes, throw off this reversing solution, rinse, and pour on the following redeveloper:

REDEVELOPER

Water	500 c.c.....	16 ozs.
Sodium sulph. (Dry) ...	15 grams.	½ oz.
Dianol	2½ grams.	40 grs.

Leave in this solution for three to four minutes, then wash for one to two minutes in gently running water and put to dry.

The first developer keeps in solution if kept well corked and may be used over for several plates in succession, but do not save from one day to another any which has been used. It may be purchased in stock solution under the name of Autol.

The second developer may be used over for several plates in succession, but should not be saved after a couple of hours' use. This can be purchased in a very convenient form, tubes, containing all the necessary chemicals to make up 7 ounces of solutions.

INTENSIFICATION

When a plate appears thin and lacking in color, it can be greatly improved by the following intensifier:

Water	100 c.c.
Sulphite of soda (dry)	10 gr.
Mercuric iodide	1 gr.

It is not necessary to wet the plate before intensification, but be careful to entirely cover the plate at once. Examine frequently by looking through the plate, as the action is rapid.

When sufficiently brilliant, put the plate in any photographic developer for five minutes to fix the intensification. Then wash for two minutes and put to dry.

This intensification solution may be used for several plates in succession, but does not keep from day to day.

Quite an interesting booklet, entitled "A Hand Book for the Amateur," has just been issued by Burke & James, Inc., Chicago. It contains considerable information for the amateur photographer. A copy will be sent free on request.

Recent Patents

1,375,662. *Photographic-Printing Machine.* A photographic-printing machine comprising a lamp-box, a window on top of the box, a mask hinged over the window and a cover hinged over the mask.

1,375,375. *Motion-Picture-Projection-Machine Shutter.* A motion-picture-projection-machine shutter having substantially crescent shaped openings arranged to mask and unmask a film diagonally across the same.

1,375,816. *Autographic Camera.* The combination, with a camera having an opening in one of its walls, of a data receiving member positionable at the opening for receiving data and movable to data imparting position adjacent the sensitized element in the camera, a septum movably mounted adjacent said opening for excluding light from the interior of the camera at all times, means for causing the data on said member to be printed upon said sensitized element, and mechanism for moving said member into and out of data imparting position.

1,376,297. *Safety Device for Picture-Projecting Apparatus.* The combination with a picture-projecting apparatus embodying a source of light, a film spanning a projecting aperture and film moving mechanism upon opposite sides of the aperture, of a rock-shaft horizontally mounted upon the apparatus, a closure for the source of light, a detent movable with the rock-shaft tending to normally hold the closure open, rock-shaft operating mechanisms on opposite sides of the aperture and means whereby a change in position of the film upon either side of the aperture moves the rock-shaft operating mechanisms from normality to release the closure.

1,376,032. *Means for Autographing Sensitive Photographic Material.* In a photographic autographic device the combination with means for inclosing and supporting a sensitive plate including a dark slide having an opening therein, a removable shutter for covering said opening, a ground glass for position in the opening, means for inclosing and positioning the ground glass comprising a housing having openings in its opposite sides, a closure cap covering the open side of the housing through which light is admitted, a movable bottom for covering the under side of said housing, and springs interposed between the housing and ground glass for forcing the latter into the opening of the dark slide when the shutter is withdrawn.

1,375,324. *Roll-Film-Turning Device.* A camera having a film winding roll, a wheel operatively associated with said winding roll, and a flexible element rove around

said wheel and which when pulled rotates the roll so as to wind the film thereon, said flexible element having one end free from connection with and disposed in the position to be grasped exteriorly of the camera.

1,372,548. *Color-Sensitized Photographic Material.* A color-sensitizing material, comprising a light sensitive emulsion containing a dye of the auramin or iminodiphenyl methane class, together with a dye of the isocyanin class, substantially as described.

1,373,493. *Film Clip.* A film clip having cooperating jaws, the one jaw having pointed barbs and the other having laterally offset tubular bosses, into the offset sides of which bosses said barbs are arranged to enter in the clip-holding action, whereby the film will be perforated and positively held by engagement therewith only in the immediate vicinity of the points of perforation.

1,372,347. *Roll-Film-Developing Device.* A device of the character described, comprising an open, stationary frame, a plurality of open frames, mounted on a shaft within said first mentioned frame, all of said frames being adapted to be independently rotated on said shaft, means to hold said rotatable frames respectively stationary within said first mentioned frame, means to fasten one end of a photographic film, and detachable adjustable means to fasten and position the opposite end of said film.

1,372,515. *Selecting-Screen for Polychromatic Photography.* Apparatus for polychromatic photography, comprising a camera lens, a transparent support having microscopic refracting elements on one face and a sensitized coating on the other face, and transparent elements having relatively-inclined surfaces for the purpose of producing an interference spectrum, said inclined surfaces being located between the lens and the transparent support, and the face of said support bearing said refracting elements being directed toward said inclined surfaces.

1,373,491. *Picture-Projector.* In a picture-projecting apparatus, a casing, said casing having a central opening formed in the upper surface thereof, a reflector plate positioned within the casing, the reflector plate being arranged at an angle with relation to the upper surface of the casing, and disposed directly under the central opening, a frame surrounding the central opening, said frame having a recessed portion, a picture supporting frame adapted to move under the first mentioned frame and through the recess, means for operating the picture supporting frame, and a cover for the first mentioned frame.

1,375,175. *Photographic Camera for Taking Up Part Negatives for Naturally Colored Pictures.* A camera for color photography comprising an objective; a rotary disk arranged in front thereof and provided with a set of light filters; operating mechanism for said disk; and a film-feeding device embodying an oscillating frame operatively connected with the disk and provided with means engageable in the perforations in the film.

1,373,893. *Photographic-Printing Apparatus.* In a photographic-printing apparatus, the combination of a support, a glazing on said support, a light-source on one side of said glazing, a frame on the other side of said glazing having an opening therein for receiving and locating a sensitized sheet, a mask comprising a thin unitary opaque sheet secured to said frame, means for securing said frame to said support, the arrangement being such that the mask is adapted to clamp a film interposed between the mask and glazing, and a suitable pad member hinged to said frame and fitting in said opening for resiliently clamping a sensitized sheet in contact with the surface of the mask and the disclosed surface of the film.

1,374,949. *Camera Case.* A camera case comprising a pouch of flexible sheet material having a lower end wall, elongated side walls connected by said end wall, and relatively narrow elongated edge walls secured to said lower end wall and side walls, and a rigid adjunct holder, rigidly backing the lower end wall, the lower portions of the side walls and the lower portions of the end walls, and forming the bottom of a camera-receiving space in the upper portion of the pouch, the backed portion of one of said edge walls being provided with an opening and with a displaceable closure therefor, and the holder being provided with an adjunct-receiving socket, the mouth of which is arranged to be covered by said closure, means being provided for detachably securing the closure to the holder.

"Automatic Plate Development and Plate Speeds," is the title of Book No. 40, just issued by G. L. Harvey, 105 S. Dearborn Street, Chicago, to accompany the No. 2 Harvey Exposure Meter. The price, including the meter, is \$2.00. If the booklet (which fits the vest pocket) is wanted alone, the price is 35 cents. Definite instructions are given as to the proper development of three slow and two fast plates, as well as instructions for others. Various other subjects in dark-room work and complete plate speeds will be found in the book.

A Practical Method of Developing Without a Dark-Room

RAYMOND E. CROWTHER

Although much has already been done to "lighten our darkness" in the dark-room by the introduction of gaslight emulsions and the study of the spectral sensitiveness of the various sensitive materials handled by the photographer—the outcome of such study being the excellent series of safe-lights which are rapidly displacing the once popular ruby glass and canary fabric of the dark-room lamp—it cannot yet be said that the average dark-room is a place in which one would care to spend one's time.

Generally, the illumination is too feeble to allow of comfortable vision; the reading of labels on bottles, for example, necessitates an inspection close to the source of light and, what is perhaps worse, the dirt, which "the eye doesn't see, the heart doesn't grieve over" until an expensive negative is ruined by such "dirt." All too frequently the trinity which holds sway in the room where development is conducted is "Darkness, dirt and disorder." But "Progress," the heretic who cares naught for the prerogatives of established deities, is at work, and the time is not far distant when the so-called dark-room will be the most comfortable and inviting room in a photographic establishment. Indeed, for those who care to avail themselves of the latest discoveries, one may say that the day of the really light dark-room has arrived.

It often happens that those to whom information would be of most practical value have not the time or the convenience, or, perhaps, the ability to assimilate such information and put it to the test of practice. This unfortunate state of affairs is, of course, not confined to the particular branch of industry in which we photographers are interested, but we cannot legitimately place that fact on the credit side of our scientific balance sheet. In a measure, we are responsible for the general failure to take immediate advantage of the published results of technical research of first-rate importance, for we cherish an obstinate conservatism, and are all too loth to "try out" the "new thing." It would be unfair to accuse the young men of our profession of undue laxity, because they show but little inclination to unravel the reports on technical research which appear from time to time scattered throughout the various scientific journals and proceedings of learned societies. Unfortunately, in many cases scien-

tists live with their heads in the clouds, and their utterances are couched in anything but lucid language, making the possession of a scientific education a necessity to the understanding of their effusions. The assistant therefore who intends to progress finds himself compelled to devote most of his leisure to irksome study. Once the elements of chemistry, physics and mathematics have been mastered, however, it is surprising how easily the results of many researches can be assimilated and put into practice. For the comprehension of many researches fortunately no special scientific knowledge is necessary, and if the interest of chronological evolution is added in the presentation of the results the subject often becomes really fascinating.

"But what has all this got to do with the abolition of the dark-room?" may be asked. Everything; for one of the most interesting pieces of research has just led to results which enable one to have such a light in the dark-room that one may read the newspaper while developing the modern high-speed panchromatic plate in an uncovered dish.

In 1898 Mercier was granted a patent for a process of correcting-over-exposure effects. The process comprised a bathing of the plate in dilute solutions of various substances, including several of the well-known developers, with subsequent drying.

This patent attracted the attention of Lüppo-Cramer, who made tests under varying conditions of the substances referred to, and in 1901 published his conclusion that the major effect of the patented process arose from desensitization of the emulsion by the solutions employed. He found that the specified substances desensitized to different degrees, but that generally with developers of the para-amino-phenol class the destruction of the original sensitiveness was of such an order that a plate bathed in a normally constituted developing solution could be exposed with impunity to a light which would fog a similar plate not bathed in developer. Here the matter rested for some time whilst other workers were endeavoring to facilitate development in actinic light, either by the addition to the developing bath of dyes, which would screen the plate from harmful light, as exemplified by the process patented by Ludwig in 1901 and that recommended by Lumière and Seyewetz in 1903, or by conversion of the silver bromide into iodide as suggested by R. Freund in 1909, and later modified by F. F. Renwick (1920).

Interest in the desensitization aspect of the matter was revived in 1907, when Lumière and Seyewetz confirmed Lüppo-Cramer's results, and made the observation that mere wetting of a plate with water considerably reduced its sensitiveness. Lüppo-Cramer immediately returned to the subject, and found that whereas only a very slight diminution of sensitiveness resulted from the wetting of a plate, the desensitization caused by immersion in certain developing solutions was quite marked with many types of emulsion, and, further, that the addition of sulphite to the developer powerfully inhibited the reduction in sensitiveness.

Continuing his work, and varying the developers and the methods of compounding their solutions, it was found that the greatest depression of sensitiveness was caused by dilute plain water solutions of amidol, triamino phenol, triamino benzol and triamino toluol in the form of their commercial salts—the hydrochlorides. Using a 0.05 per cent. solution of these compounds, for example, it was established that the sensitiveness fell, on bathing a plate for one minute, to 1-200th of its original value in the case of amidol, and as low as 1-600th of its original value in the case of triamino toluol hydrochloride. This led at once to a practical method of developing ultra-rapid non-color sensitive plates in bright yellow light, all that was necessary being a preliminary bathing in the dark for one minute in a 1 : 2,000 solution of, say, triamino toluol hydrochloride. Thereafter the plate may be lifted from the solution in bright yellow light and developed by inspection in a light sufficiently powerful to fog wet slow bromide paper rapidly.

But in these days of the more or less common employment of ortho', screened ortho', and panchromatic plates the matter could not be allowed to rest at this stage of incompleteness, and it became necessary to find a substance which would desensitize these varieties of plates and render their development by inspection a feasible proposition.

The happy spirit of co-operation which is the mark of scientific workers in every country placed at Lüppo-Cramer's disposal the range of products manufactured by the German dye-making firms, and, knowing what type of substance was likely to be of service by reason of its chemical constitution, it was not long before the problem was solved. The final choice was made of the dye known as phenosafranine, and the effectiveness of this body is such that for

the development of non-color sensitive plates in a yellow light bright enough to allow of the comfortable reading of newsprint at two yards' distance from the light, it is only necessary to replace one-tenth of the water used in making up one's favorite developer with an equal volume of a 1 : 2,000 solution of the dye, and screen the plate from the light during the first half minute or so in the developer. An easier method, one which will no doubt commend itself to the English worker, and which is applicable with complete success to panchromatic plates, is the following:

In the dark the plate is immersed in a 0.05 per cent. solution of the dye, and any time after one minute's immersion it may be removed therefrom in bright yellow light—or even by the light of a candle or oil lamp at a distance of 5 to 6 feet and developed by inspection. The plate may be lifted from the developing solution and inspected by transmitted light with impunity, a circumstance which indicates that the action of the dye is not simply that of a screen serving to cut off harmful light. As a matter of fact, one minute's immersion of a dry fixed-out plate in the 0.05 per cent. solution of the dye stains the gelatine a bluish shade of red which, when examined by the spectroscope, is found to transmit the whole visible spectrum, only partially absorbing a short section at the junction of the blue and green. The worker who develops continuously will place his plates in the dye solution contained in a tank and remove them as he is ready for developing them, being unconcerned whether he is dealing with an ordinary, ortho', or panchromatic emulsion.

It may be objected that the dark-room is not entirely abolished and that the process offers no advantages over the method of bathing the plate in the dark before development with a dilute solution of potassium iodide, as recently recommended by F. F. Renwick, but a moment's consideration will convince one that the new process marks a real advance, for the immersion of the plate in the dye solution necessitates only a dark cupboard or recess, and can be undertaken by the least skilled hand in the work-room.

As far as comparison with the potassium iodide process is concerned, it is only necessary to recall that, in addition to the disturbance of the density obtainable, it is necessary to remove the potassium iodide by washing in the dark, to use special developing solutions, and a potassium cyanide fixing bath, and contrast these conditions with those of the phenosafranine process, to

rate the latter at its true value. In the new process there is no disturbance of the plate's characteristics; no washing after the one-minute immersion in the dye solution is called for; any developer may be used according to the particular fancy of the operator or the demands of the subject, and the usual hypo bath suffices for fixing. Further, the phenosafranine treatment considerably reduces the amount of chemical fog frequently encountered on panchromatic plates.

In one respect it is unfortunate that the most powerful desensitizer so far discovered happens to be a dye which, by virtue of its chemical constitution, tenaciously stains the gelatine. Somewhat prolonged washing in running water is necessary for its complete removal. This is not an uncompensated drawback, however, for one can be certain that when the film is washed free from dye it is also free from hypo. In cases where prolonged washing with water is inconvenient, there are two methods available for hastening the operation. The first is to treat the developed, fixed and approximately hypo-free plate with a bath made by mixing equal volumes of a 2 per cent. alum solution and a 5 per cent. hydrochloric acid solution. The latter solution can be readily prepared by diluting one volume of the commercial acid with six volumes of water. The action of this bath depends upon the decomposition of the gelatine-dye complex by the acid, the strength of which is sufficient to act adversely on the gelatine unless the latter is protected—hence the use of the alum. Two or three two-minute changes of this bath allows of the removal of the dye by short subsequent washing. The second method of shortening the wash is the treatment of the hypo-free plate with a dilute solution of nitrous acid, whereby the dye is converted into a bluish violet compound which possesses but little affinity for the gelatine. The nitrous acid solution is conveniently prepared by dissolving five grains of sodium nitrite in two ounces of water and adding thereto ten minims of commercial hydrochloric acid. A four or five minutes' treatment with this bath should allow of a colorless film being obtained after five minutes' subsequent washing. In the writer's experience, the removal of the dye by simple water washing is preferable to either of the "short-cut" methods, and of these latter he prefers the acid alum treatment.

The dye with which Lüppo-Cramer carried out his research was the chemically pure product, and the writer has confirmed

all his conclusions when using a sample of the same substance. This product in its pure form is not, however, an article of commerce, but the writer believes that a well-known firm of plate-makers is about to place on the market a dye which exhibits all the desirable characteristics of pure phenosafranine. Further experiments are being made by the writer, details of which, together with an account of some remarkable actions of the dye-impregnated plates on developers, must be held over for a further communication. In the meantime it may be noted that the process is not protected by any patent, and since the staining of the film in no way interferes with inspection of the developing image—the suppression of tendency to fog actually facilitates critical observation—it is to be anticipated that the process will rapidly become popular. —*The British Journal of Photography.*

Doctors on Art

In a recent editorial, the *Evening Ledger* of Philadelphia, printed the following:

Dr. Dercum, Dr. Burr and Dr. Wadsworth, specialists, all of them, in mental diseases, and very able and distinguished specialists at that, stated only half of the case when they suggested that much of what passes for art in modern galleries is the product of minds imperfectly balanced.

If a man is crazy, who can get his name into the papers with unfailing regularity and achieve something like fame and an automobile and a house in the country without hard or consistent work, then the advanced faddists, whose canvases bewilder and stun visitors to some of the Academy exhibitions, really belong, as Dr. Dercum suggests, in the insane asylums.

Painting of the older fashioned sort was and is exacting work. It cannot be done successfully by any one who hasn't it in him to study and labor for years with an almost pious zeal. Cubism like the work of the vorticists and futurists generally requires no particular skill. At best it may spring from an emotional mood or out of the deep darkness of a transient mental aberration. It provides a short cut to notoriety and sometimes a way to easy money.

The artists who do that sort of thing are far from being mad. They are rebels against work. They do not have to learn to draw. They do not trouble themselves about color harmonies or form or attempt the difficult task of interpreting in lasting

form the hidden beauty and dignity of the life about them. They say proudly that they leave all that to the imagination of the beholder.

That is precisely what the Bolsheviks have tried to do in politics. They were unable so to order existence that it would be satisfactory to all sorts and conditions of people, so they ordered it in ways satisfactory to themselves alone.

Life and art are complicated. Infinite skill is required to direct either in the way that it should go. But skill comes only with toil, and everybody hates to toil nowadays. Rhymed verse, for example, is hard to do. So free verse was invented by the newer poets for their own benefit. Laziness is the peculiar affliction of the painters of seemingly crazy canvases, and if all the lazy people in the country were to be put in the lunatic asylums the streets would soon begin to appear deserted.

Panchromatic Sensitizing Dyes

In a recent note in the *Bulletin* of the French Photographic Society, MM. A. and L. Lumière and H. Barbier describe the properties of a new series of dyes for color sensitizing which have resulted from experiments previously made by M. Barbier and communicated to the Paris Chemical Society. These dyes have been obtained, on the one hand, from the cyanine group of which ethyl red, pinaverdol and others are members, and, on the other hand, by prolonged boiling of an alcoholic solution of a mixture of di-methyl-amino-benzaldehyde with an iodo-alcoholate of quinaldine or lepidine in the presence of a condensing agent such as piperidine. The dyes thus contain one or two dimethylamino or diethylamino groups. A large number of the dyes have been prepared and tested, the most notable among them appearing to be one to which the name "Pantochrome" has been given. This sensitizer is obtained by the condensation of iodo-ethylate of dimethylaminoquinaldine with dimethylamino benzaldehyde. It is found that its absorption spectrum contains two bands from 490 to 580 and from 660 to the end of the spectrum. Its spectrum sensitivity shows a maximum about 480, and then a remarkably even band from 520 to 630, with progressive fall to the limit of the visible red. "Pantochrome" thus sensitizes for the whole spectrum, whilst exhibiting a small minimum about 500.—B. J.

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STUDIES OF DESENSITIZERS

THE introduction of phenosafranin for reducing the sensitiveness of plates has attracted a great deal of attention, and articles relating to it have appeared in the leading photographic journals of all countries. The inventor, Lüppo-Cramer, has presented a large amount of information concerning it in a special work. Lately, the firm of A. & L. Lumière and Seyewetz has presented to the French Photographic Society a paper describing the results of trials of many substances with a view to discover other desensitizers and to elucidate, if possible, the nature of the desensitizing action. This paper appears in a recent issue of *La Revue Française de Photographie*, from which the following abstract is made. One property of phenosafranin is some objection to its use, namely, its high staining power of gelatin, and if a substance of equal power to desensitize but which has no staining power could be secured, a notable gain would be made.

Phenosafranin belongs to a type of colors containing what is termed a phenazin nucleus, and Lumière and Seyewetz directed the investigation first to ascertain if this particular molecular structure is the only one that determines the peculiar property or do other classes of bodies possess it? Further, it was advisable to ascertain if the desensitizing action is extended to panchromatic plates. The interesting question arises whether, if several desensitizers of apparently equal power are available, does each have a specific adaptability to a given case. Lumière and Seyewetz also raise the question as to whether the action is chemical, physical or chemico-physical. It seems hardly worth while to discuss such a question until we have clearly determined what is meant by the several terms.

Fourteen colors, all forms of the safranin type, were tried in comparison with safranin. Of these, toluosafranin is doubtless nearest in composition to

the standard. None of these substances was found to be fully equal to phenosafranin, and many were decidedly inferior. One of them, a very complicated derivative, was found to destroy to a certain extent the latent image, another was but slightly soluble and one that approached closely the power of the standard, colors the gelatin quite obstinately. Several of them are not commercial articles, but were specially prepared by the investigators.

In the experiments, plates of the highest sensitiveness (not panchromatic), were used, all receiving the same exposure, and afterward immersed for two minutes in solutions of the colors ranging from 1 to 100 to 1 to 2000 in strength. The stronger solutions were first used, and then the tests made in solutions of gradually decreasing strength. Development was carried out by the light of a candle 1.5 meters distant (about 5 feet) the light being reflected directly upon the developing dish, so as to have the plate exposed from above. The developer was paramidophenol (dianol), allowed to act for four minutes at about 17° C. (63° F.), the image being examined by transmitted light twice during the procedure, first after 2 minutes and then after 3½ minutes. If the picture thus obtained showed only a slight veiling, the procedure was repeated with panchromatic plates. The experiments seemed to indicate that certain molecular conditions are necessary to the desensitizing action—the presence of a phenazin nucleus and the substitution of amidogen groups in the benzene ring—but, notwithstanding that these conditions are fulfilled in the color known as neutral violet, it has not marked desensitizing powers, and is inferior to neutral red, which approximates to phenosafranin in its action. Neutral red is a brownish red dye, having little brilliancy, coloring gelatin only faintly, and much more easily removed than the safranins, but the proper impregnation of the plate to secure full measure of desensitization requires double the time that is required by the standard; that is, 4 minutes instead of 2 minutes. As noted above, the colors tried were not found to possess quite the power of phenosafranin, but one of them, chreso-safranin, can be removed very quickly from the film.

The tests were then extended to panchromatic plates of wide range of color sensitiveness. The procedure was to photograph spectra on each plate, immerse, in darkness, for 1 minute, develop for 1½ minutes, also in darkness with diamidophenol, then continue development for 2½ minutes at 20 inches from a 16 c. p. electric bulb, covered by yellow papers, stained with tartrazin, giving a very good illumination. During this latter period the plates were examined by transmitted light four times for a period of 3 seconds each. Most of the substances tried were unsatisfactory, but toluene red and aurantia (a yellow dye) gave distinct desensitizing action.

The paper contains also the results of trials of substances not related to the safranins. Among these a drug, apomorphin hydrochlorid, was found to have a distinct effect, a somewhat remarkable fact. Picric acid is also not without effect, but acts more like a screen and the action differs with the strength of the solution.

They conclude that the action of the safranins is a specific desensitization



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and not a mere screening, inasmuch as the violet dyes of the type act as well as the red; moreover, if, before development, the color is washed out, the sensitiveness slowly returns and when all color is gone, the plate has resumed its susceptibility to light. Phenosafranin is so far the only material eminently adapted to desensitization in general, but where complete immunity from red light is not indispensable, aurantia will be found applicable, as it does not stain the fingers, is more easily removed by washing, and does not involve, as phenosafranin does, the occasional employment of a decolorizing solution.

CONTROL IN DEVELOPMENT

CONCERNING what constitutes a perfect developed negative, there is, of necessity, much disputation, since the contestants can never reach a consensus of opinion, because they cannot come to an agreement of terms. It is needful to consider first what features in a negative are essential to express what the artist demands in the print, his motive and intention in making the exposure.

The mode of evolution of the negative should, therefore, be in terms of print value. The negative is only a means to a certain desired end, not the end in itself.

The object of the pictorialist, and by pictorialist we mean any one who engages in photography for aesthetic, not technical, interest, is to produce such a negative as shall effectually translate his artistic effort.

The photographic artist can express a picture in a high or low key, one in which contrasts are presented, or one in which softness and modulation is the desired end; just as the painter effects, because Nature presents these aspects to both, but the painter, by his studied art, has greater control over his mode of expression than the artist with the camera.

The photographer's means of control is by development, essentially mechanical in its operation. But if this mechanical imposition is made to do the photographer's bidding, he finds that, instead of a hindrance to the accomplishment of his purpose, it becomes a contributory factor of success.

He must study, however, the adaptation of development to the nature and character of the exposure or he shall fall short of expression of the truth, of the original, if he does not possibly falsify it. In speaking of truth, we might here take opportunity to speak of the great service photography has done for art in emphasizing the necessity of truthful representation of Nature.

The public is more critical in the matter of character and drawing, and so is better able to discriminate between good and bad pictures.

Artists dare not take the same liberties with Nature they used to—such a thing would not now be permitted in sane art. You would have to join the cubist or symbolist or the other insanities affecting art.

The only sort of liberty the artist dare cautiously indulge in is to alter the grouping of the objects in a scene or to leave out some intrusion which interferes with the composition.

The chief means of expression by the photographer is in selection and his main resource in studying by intelligently controlled mechanical means how to depress in his picture what is undesirable, or non-essential, and emphasize what is featureally effective.

Timing of exposure is perhaps the chief means of control, for the full employment of the factor of development is impossible without it. Not that development may not be made accessory to improvement of results, where the initial factor, time, has been unconsidered—but that the best pictorial accomplishment is attained only by consideration of adequate exposure corresponding to adequate development.

Development is a fine art in itself, and the artist can only give expression to his full pictorial intention by study of the relation between the exposure and its development.

But the adaptation of this means to artistic purpose is, as we said, subject to mechanical skill.

In the first place, let us consider the agents of development. It is not necessary here to go into the nature of their chemical action, but only to remind you that their action is not uniform in producing the effect the artist aims for. We have a galaxy of these developing reagents and a specific effect is possible in the selection of any particular developer.

We might conveniently group developers into, first, those which bring out the lower tones soon after the appearance of the high lights, such as metol, rodinol and weak pyro. With such, if an exposed plate is removed from the developer at an early stage of its progress, there would result what is called a flat negative with detail in the shadows.

Then, again, we have developers which do not bring out shadow detail, that is, in the lower tones until the high lights have attained some density—such as hydroquinone, glycin, edinol and strong pyro. A plate in such a developer, if withdrawn at an early stage, presents moderate contrast, but not much expression of detail.

One not experienced in manipulation with respective developers might come to the conclusion that in this latter case the plate had not received adequate exposure, while in the former case he would consider the plate overexposed. Whereas, in both cases, had development been appropriately performed (prolonged), good negatives would have resulted.

What, therefore, are the limitations incident upon development prolongation?

Of necessity, there is an obvious limit to the rule that the more prolonged the process of development, the greater the contrast. The limit is reached as soon as the highest light has attained its greatest density possible with the plate.

Any prolongation of action beyond this limit implies that the various lower densities tend to approach the maximum density possible. Hence, from this point, contrasts, instead of increasing, are reduced.

Increasing the content of the bromide of potassium (restrainer) or decrease of alkali, tends to hold back the lower tones and hence is an agent of

control. But these changes in the developer must be made before the plate has the solution poured over it. The effect is not had if they are applied after development of the image has begun in the plate.

Use fresh developer with every plate.

It is economy to be sure to repeatedly use the same solution—but mean savings, as far as art is concerned. There is a change effected in the developer during the process of its action upon the exposed film. It is not identical with a fresh solution.

In making a comparison in the action of the different developing agents or of the various modifications in the constituents (proportions) of any one developer you may be working with, bear in mind that the real significance or value of the difference in character or modification must be recognized.

Take, for instance, pyro soda development of a certain strength and arrangement of proportional ingredients, and the same solution diluted ten fold by adding the necessary volume of water, you find that in both cases, each produces the same amount of shadow detail if the action in the latter is prolonged and in the former properly reached.

But this does not warrant the assumption that there is in consequence no advantage gained by working with the diluted developer, because the faint shadow detail cannot be considered isolated, but only in its relation to the other parts of the scale of gradation.

Where one solution might develop certain faint details to a particular strength combined with only a moderate degree of density in the highest light, the other, by the time that the same faint details had acquired the same strength, would have rendered the lighter tones so opaque that the negative would not be in shape to give a good print, without a lot of shading, etc.

We are often reminded that all developers will give equal density if time is given to work it out, but then, is the mere attainment of a certain density of the high lights the great and only desideratum? Is it not, on the other hand, more important to secure proper relation of high lights to the weaker tones? And in doing this you will find that the method of the constitution of the developer and the agents in it have a very important role to play.

In making comparison of developers for securing density, we find that equal strength is reached in the high lights, in the respective developers, but one of the plates may show relatively weak shadow detail with the extreme shadows very clear, while the other shows more detail in the shadows and the darker details more dense and out of the scale of gradation, as well also as the shadows themselves.

You must judge the entire scale of tones in their relations, not judge from separate parts.

Where there have been errors of judgment in exposure it follows that the method to be pursued is different where discovery is made of the particular error, only on the appearance of the image when subjected to the developer, and where the error is anticipated. In the latter case we can make compensation by modification of the reagents, but in the former it is self-evident that

conditions are different where developer action has been going on for a little time.

A somewhat drastic treatment is here required for modification of action on the image. If under-exposure manifests in the manner of appearance of the partial development, transfer the plate immediately to a tray of clear water, and allow it to remain therein for 5 or 10 minutes and then continue the development in a dilute solution.

If overtiming is indicated, transfer to a 10 per cent. solution of potassium bromide and then continue the development with a properly restrained developer.

Far greater control is possible by modification of developer before the plate has been allowed to partially develop.

IMPROVING PRINTS BY TRIMMING— WILLIAM S. DAVIS

JUST because one's negatives may be of uniform size is no reason why the prints should always be the same, or show all that the negatives contain, yet it is a fact the average amateur thinks of trimming prints or masking the negatives as simply a means of getting rid of unsightly raw edges to give a neat, clean look to the work. While this result is desirable in itself, trimming or masking should go much further than this as a rule, since it can be made to contribute greatly to the effectiveness of the finished print by eliminating the superfluous material which, for one reason or another, is often included in the negative. There are a number of reasons why the latter should occur, such as the available standpoint being too far away to allow of making the image of the essential material of sufficient size to fill the picture space. A change of viewpoint might upset a pleasing combination between the foreground and distance, or the material may not fit the shape of the picture space, one subject looking best in a nearly square shape, while another requires a long panel. Then, too, in the hurry of making a snapshot the camera is not always held in a level position, and as a result the horizon shows as a slanting line in the negative, a defect very noticeable in marines, yet one which frequently goes uncorrected by proper trimming of the print.

To sum up, we may name the following as the most important reasons for trimming prints intelligently:

1. To correct vertical or horizontal lines of the subject which are off the true.
2. As a means of removing superfluous matter which distracts the attention from the main feature and weakens the presentation of the subject or story-telling power of the photograph.
3. For the purpose of improving the general composition by fitting the shape and proportion of the print to the subject matter.

As an aid to thoughtful trimming the reader will find a pair of L-shaped



MAE MARSH

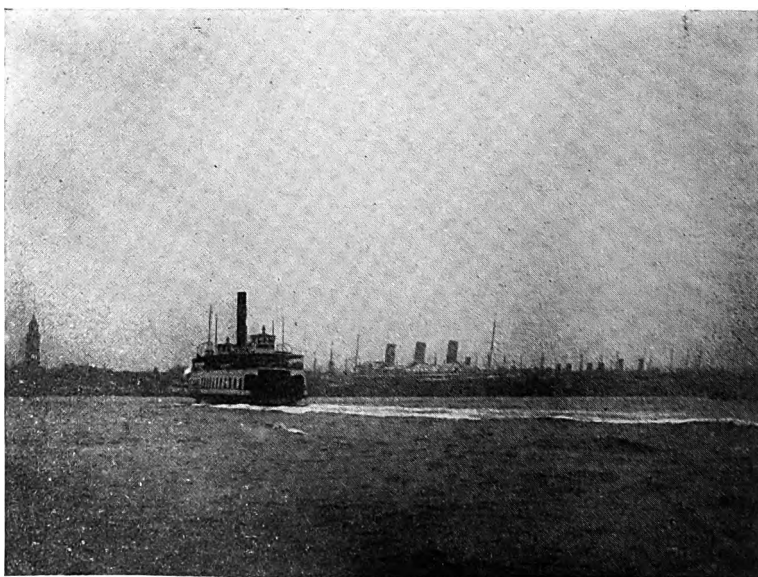
© NED VAN BUREN

times the real gem of the lot being found in a small section of an apparently commonplace print. When going over a number of proofs in this manner it is a good plan to mark lightly with a pencil the best position of the masks for later reference.

Upon investigation several alternative methods of trimming will sometimes suggest themselves as equally desirable, while occasionally a single subject contains "bits" for several separate pictures, each more pleasing in character than a print of the whole.

While a contact print is always rendered more effective by proper trimming, even though it calls for such drastic treatment as to greatly reduce the area, the reader who possesses any kind of an enlarger has the advantage of being able to eliminate undesirable matter and still have the prints of good size by the simple expedient of enlarging only the selected portion. This is especially true when a focusing type of enlarger is employed, since the degree of magnification can be regulated according to the area of the negative used, thus permitting making the finished prints any size which may be desired within reasonable limits. In extreme cases the writer has made enlargements to 8 x 10 inches of sections not over 1¼ inches in length from 3¼ x 4¼ negatives. Such drastic limitation of the material selected from any particular negative is, of course, seldom required, but it serves to illustrate the possibilities which exist.

Usually a very moderate amount of trimming will suffice, but that little may cause quite as much improvement in the general appearance as in cases where only a small part of the original is retained.

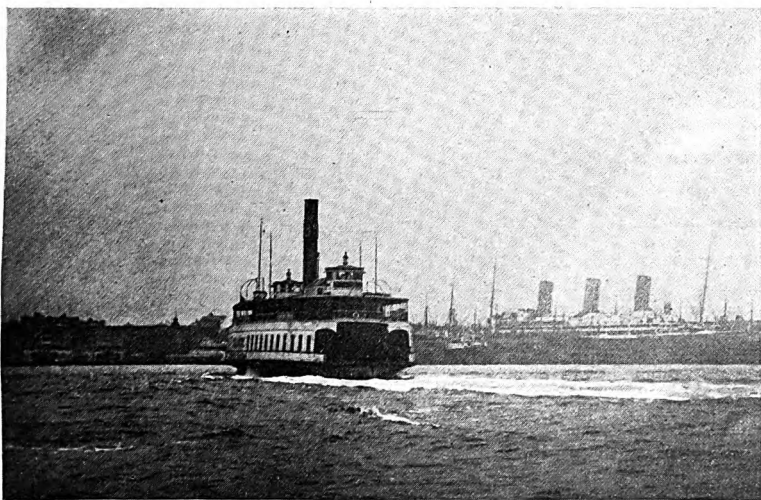


NO. 3—UNTRIMMED

Our first illustration (No. 1) shows a common fault, caused by holding the camera in a slanting position. This subject was taken from one of the New York bridges, and the necessity of holding the camera in an awkward manner to allow the lens to clear the railing of the footpath accounted in a measure for failure to get the subject matter located correctly, which is evidenced in this instance by the vertical lines of the buildings being badly tilted toward the left-hand side. The inclusion near the right margin of a wire hanger from one of the suspension cables was also unintentional, and, of course, meaningless to the picture. The trimmed print (No. 2) shows the buildings standing plumb and enough taken off the right-hand side to exclude the hanger, making the picture a far better record photograph of the scene.

The vertical lines of an architectural subject, or the horizontal line of the water in an open marine, are always sure guides to follow in trueing up prints, but one sometimes runs across subjects which are equally in need of being true in this respect, yet at a glance are a bit misleading when a definite horizontal or vertical line is not prominently shown. For example, a shore line seen in perspective cannot be accepted as a horizontal line, for the reason that the viewpoint of the spectator being some distance above the water, the line of the latter where it meets the shore would naturally appear to slant slightly, even when quite distant. There is nearly always some detail in prints needing accurate trimming which gives a clue to go by, as when reflections are present, since they must come directly below the object causing them.

No. 3 is a typical example of excess of material detracting from the effectiveness of the result. The ferryboat, of course, is the feature of main interest, while the liners at their piers beyond form satisfactory accessories, but as here shown the large area of sky and water dwarfs the image of the



NO. 4—ENLARGEMENT FROM MOST DESIRABLE PORTION OF NEGATIVE

ferryboat, making it relatively unimportant. This has been corrected in No. 4, which is an enlargement from an oblong section of the negative containing all that is of real interest. By noting the relative sizes of the details in this, as compared with the untrimmed print, the reader will see that approximately one-half the material to the right of the ferryboat has been excluded, almost half the sky, a third of the water and a narrow slice along the left margin, making the section used $1\frac{5}{8} \times 2\frac{1}{2}$ inches from a $3\frac{3}{4} \times 4\frac{1}{4}$ negative. This subject, however, happens to be one of those which may be trimmed to more than one shape. This is shown in No. 5, which was made from a vertical section $1\frac{1}{2} \times 2$ inches, thus concentrating, still more closely, attention upon the ferryboat.

FLOWER PHOTOGRAPHY—J. BARTLETT

FLOWER photography is certainly a seasonable topic for spring, just as a discourse on snow landscapes is suitable for winter camera study. One thing we may say, however—that it is not the easy task which many think it is to make a good pictorial reproduction of a flower by means of the camera, for really the photography of flowers demands, on the part of the photo artist, as much consideration as pictorial portraiture. We must just as conscientiously study the flower's individuality as we do the model's peculiarity of temperament. The indiscriminate pointing of the lens at a well-posed single flower or an elaborately arranged association of floral beauties will never yield either good pictures or satisfactory photographs. You may imply from this that we believe in the inseparableness of good technique and artistic effect, and you are right in your implication. Impressionism is a dead failure with flower subjects, whatever else it may do pictorially in photography, and we admit that it does a good deal; but with flowers anything like broadness of treatment is incompatible with artistic effect. All attempts by the impressionists to give us art studies with flowers have, in our estimation, proved dead failures, but they may perhaps please the votaries of the present craze for post impressionism.

The literary treatment of this subject is most tempting to one of our temperament, but we shall resist the enticing allurements of these most beautiful things in Nature and confine ourselves to the photographic province of the subject.

One great fault with a good many photographs of flowers is the mistaken idea that they have plasticity. A flower, no matter how brilliantly white, should never suggest in its photograph that the original was carved in marble or alabaster. Many of the examples accompanying articles written on floral photography look as if the makers of the photographs courted a presentation of this carved-out or chiseled appearance. It may be evidence of technical skill to distort the image of a flower by projecting it upon an intense dark ground and suggesting that it is a carved image on a tombstone rather than a graceful living structure, but it affords no indication of esthetic feeling.

The delicate translucency of lilies of the valley or the mystic, interpenetrat-



Photo by Goldensky

THE LATE FRANK S. NOBLE, Rochester, N. Y.
(Vice-President Eastman Kodak Co.)

Died July 5th, 1921

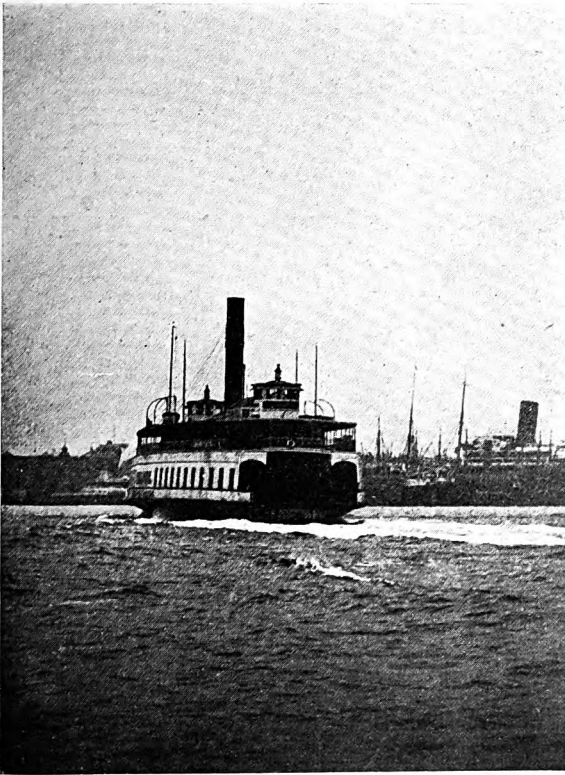
Aged 52 years

ing light of the petals of the white rose can never be secured by an unmitigated flood of strong light, no matter at what artistic angle it may come. Understand, we do not mean that a proper amount of relief is not desirable, but the true textural quality dare not be slighted.

Indeed, side lighting is often most effectual for true and adequate textural rendition; some varieties demand such an illumination, those flowers having damascene workings or plication of petals. Nevertheless, one must study just what character of lighting is demanded; top, side or even back illumination, sometimes, what might be called a dominant bottom illumination, is effective; that is, where the light is really projected by means of a mirror or screen.

In floral groups it may be found necessary to support the shadow side by reflected light, but great caution here is necessary. We must keep the reflection at considerable distance, so as to preserve the delicate detail or texture of the shadows and at the same time keep intact that delightful semi-transparency, which not only flowers, but every well-illuminated subject should show in the shadows. It is necessary, moreover, to take observations of your flower model from different angles of view.

You thus shall notice one direction which gives you the essential trans-



NO. 5—ENLARGEMENT FROM A VERTICAL SECTION OF NEGATIVE

lucency we are such sticklers for. You thus avoid our detestation, plasticity, or that unpleasant cut-out effect.

An inclination of your camera a little, some more than a little, toward the source of illumination will give you the revelation of beauty, the glow of vital splendor. Of course, you may have to use precaution where you point toward the light of keeping the rays from entering the lens, but you are daily up to such presentations and we need not tell you how to encounter them. Sometimes you may, in the direct pointing, manipulate the background so that it prevents ingress of light. Guard the lens with a shade, where you think the surroundings are invasive.

A subdued light, but not too depressed illumination, is generally preferable and a good exposure essential. We know how prone most flowers are to droop, and we must humor the frail, tremulous ones by having everything in readiness before posing and lighting them. To prevent drooping of cut flowers while undergoing their ordeal, you should insert the stem in water in small homoeopathic vials or in moist moss.

Take the photographs in a cool room. A cake of ice somewhere nearby will make your flowers behave properly.

One word, and we are through. Generally speaking, the orthochromatic plate should be used, but for most white flowers you can get all the desired results with an ordinary plate; but have a special care not to abuse the agency of the yellow screen. Do not use it unless absolutely needed; never be in a hurry to evolve the image. Use a weak development and let the image come up slowly and gradually, and you will get rid of the plasticity and secure the rich half-tones and give a true reproduction of your flower.

MOUNTING ODD SIZES OF PRINTS UPON LARGE MOUNTS

IT falls to the share of every photographer with a decent business to have now and then to mount his work in special styles to meet the wishes of his customers or to make the prints look their best. No matter how many sizes and styles of stock mounts may be kept, there is always a job turning up which cannot be adapted to any one of them, and it devolves upon the photographer to devise a suitable support for it. Formerly it was regarded as a matter of course that photographs should be mounted upon stiff cardboards, but it is now frequently necessary to mount them upon paper or even canvas, so that it is necessary to be prepared to meet all requirements without loss of time. This is a simple matter for the metropolitan photographer who is within easy distance of a cardboard manufactory, for he can get a special board made to order in a few hours; but his provincial or colonial brother must be more self-reliant, and must make or find his mounts as best he may. To this end it is an excellent plan to start with a stock of three or four dozen mounting boards having surfaces of various tints. These may be had of about 8-sheet thickness

in Imperial size (about 30x21 inches) for threepence or fourpence apiece. They may be had with either a smooth or "Nature" paper surface. It is well to supplement these with a quire or two of assorted cover papers which may be used as flexible mounts or to cover cards with in case none of the special tint is in stock. In most cases amateur cardboard making is hardly successful, and this is mainly due to the omission of the simple precaution of keeping the card under pressure until it is perfectly dry. If this be done it is quite easy to make mounts which will compare with the "shop" ones. Flour paste or starch made as for mounting may be used, and both paper and board should be evenly coated, brought into contact, especial care being taken to avoid air bubbles, these being expelled by "rubbing down" as when mounting prints. If the card is inclined to be thin or is of inferior quality, it is advisable to paste another sheet of paper on the back; this will counteract the pull of the facing paper and will insure the card keeping flat under all conditions. The easiest way of drying a mount is to place it face down upon some dry, clean blotting paper, to put several more sheets of paper upon the back, and on these lay a flat board or slab of glass or slate, weighting it with any heavy objects which may be handy; for instance, I have used a copying press, two 14-pound weights and a pair of dumb-bells. The whole should remain undisturbed for at least twelve hours, and may then be relied upon not to curl. If a paste-down tint is to be added it is desirable to fix it at the time of covering, so that a second drying will not be necessary.

Trimming odd-sized prints with the ordinary knife and ruler is a somewhat difficult operation, and if the print is a valuable one, or if several have to be cut to the same size, it is a good plan to cut out a mask of stout paper, which can be laid over the print and the size marked for cutting. This greatly facilitates matters, especially when using a guillotine or a Merritt's trimmer. It is better to make a fine pencil line, and not merely to prick the corners with a needle, as many do, as the first cut destroys two of the needle-holes, and this often leads to inaccuracy. The mask may be used also as a guide for cutting the tint by tracing the size on the back of the paper and ruling lines parallel with the sides at the distance representing the desired margin.

None but the most expert mounter would attempt to center a print on a large mount having no tint or line without previously marking the exact position for the two top corners. This is best done by laying the print itself upon the card, keeping it flat meanwhile by a cutting shape or other glass plate, and carefully measuring the width of side and top margins, which should usually be equal. Modern taste demands considerably more space beneath the print than was formerly considered sufficient; about one-fourth to one-third more should be allowed for the bottom margin—that is to say, that with a six-inch margin at the sides seven and a half to eight inches should be allowed at the bottom. If not required it is easily cut off. An ordinary needle fixed in a pen-holder makes an excellent pricker for marking the corners, as it is more accurate than the thicker pencil point, and its marks soon become invisible even if not covered by the print.

For attaching the print each worker will probably prefer the mountant with

which he is most familiar. Good starch paste or one of the commercial dextrine preparations answer well. A sort of semi-dry method is to coat a sheet of glass with glue or even with dextrine paste, and to lay the print face upward upon it, pressing it well into contact, and then peeling it off from the glass and laying it down upon the mount. This gives the least tendency to curl or cockle, especially if glue be used, as this practically sets before the print has time to stretch. Dry-mounting with shellac tissue answers admirably, but in many cases our special mounts will not go into the press, and for large work the "ironing down" process is hardly to be recommended, especially with collodion papers.

If a more delicate tint than can be obtained by using the ordinary paste-down be desired, it can be produced by means of the air-brush either before or after the print is in position. A mask to cover the print as well as one to cover the outer part of the mount will then be required, and a very finished effect may be got by having the center mask about $\frac{1}{8}$ -inch larger than the print all round, so that a narrow white or light margin appears next the print, with a darker band around it. Such tints are as easily made graduated as plain, and in some cases the graduation will appreciably help the picture. A still more elaborate finish may be obtained by ruling a series of fine lines in pencil, indian ink, or sepia around the print, and filling in the spaces with pale washes of water color, gray, sepia, and yellow or buff being most effective, although brighter tints may be used for certain subjects.

It is sometimes necessary to mount a print upon a linen-covered stretcher so as to show a wide margin. In such a case it is advisable to damp the paper to be used for the margin until it is quite limp, then to mount the print in the usual way, next without letting it dry turn it over and paste the back well, give the canvas on the stretcher a coat of paste and lay it down upon the pasted paper, and rub it into contact from the back, using a bone folder or paper knife to rub underneath the edges of the frame; if neither of these is to hand, use the handle of a teaspoon.—*The British Journal of Photography*.

EFFECT OF PHOTOGRAPHY ON LANDSCAPE

THE effect which the discovery of photography at the time had upon portraiture has been considered and determined as something most beneficial. Its action, however, was more immediate and directly in removing portraiture from the unnatural presentation of the face than was its influence upon landscape painting, which certainly, at that day, was most faithful in the delineation of scenery.

Landscape had advanced much beyond the art of the eighteenth century and the early decades of the nineteenth, but photography seems to have developed a new phase of landscape.

We know that landscape, as a thing in itself, was seldom, if ever, the motive in the pictures of the old masters of painting.

Even in the great works of the fifteenth and sixteenth centuries, it formed merely the setting for human interest.

There had to be some background to the Madonnas and other holy figures, and consequently landscape was sometimes necessary to carry out the motive, but it was never seriously studied; sometimes, indeed, it actually appears unsuited, really a distracting feature in the intense conception of the figure studies.

To be sure, we except a genius like Da Vinci—what he paints of landscape is essentially true, but always idealized and in support only of the human conception.

It may be a coincidence that the earnest study of nature for its inherent beauty and sentimental value began very soon after the genesis of photography, or at least after the discovery of the camera obscura, and it is worthy of note the rapid change which took place in landscape painting when the means of making records of nature became an accomplished fact. Of course, the conscientious painter, who took to photography as a side study, or as a mere recreation from serious work, scorned any suggestion of employment of it as a basis of his work, but even the acknowledgment of the use of the camera, as a facile means of record of natural phenomena, could not keep revealing to the eye of the artist some new hitherto unnoticed phases of Nature, some new conceptions in artistic harmony of light and shade.

Now, candidly, any one will admit that if some painter, before the discovery of the art of photography, had shown up on his canvas some of the delightful exhibitions of our modern pictorial photography—those marvels of subtle light and shadow and chiaroscuro, would not his fellow-painters have hailed him a rising genius and called his work marvelous and original?

Honestly, now, looking at some of the works of the old masters; yes, some of the very best, do they not put you in mind of the pictures by modern pictorialists of the camera?

But to go back a pace. We said that at first the painter condescended to use the camera, as a rapid pencil, for securing memoranda of Nature's detail, to save hours of laborous drafting—an excuse, by the way, still vouchsafed by present-day detractors who employ the camera for something more than a recording instrument—but a rapid change took place when the process of photography was simplified and its practice became more general. It is not long before we see photographs of sea and sky and landscape made by painters with the camera which are no longer mere topography, records or shorthand notes to work from, but beautiful things in themselves, though only photographs—revelations to the artistic eye of some evanescent natural phenomenon which the painter had failed to perceive with the normal eye.

And then painters like Hamerton, who railed against any art claim of photography, were compelled to acknowledge that the camera might be made to be a means for artistic reproduction.

Strange to say, it was not in the direction of minutiae of detail which the painter was willing to accord that the new art was found to be so valuable

an accessory, because he knew that this detail was possible with the skilled handling of his pencil, that *f64* can hardly show more wonderful execution than is seen in the paintings of the Dutch school. No, it was not this accuracy of rendition of textural values that photography might safely be accredited with and which the painter might call to his service as a labor saver, as it was the revelation of the marvelous expression of light and shade and space, atmosphere and beauty of chiaroscuro. Conventionalism, the bane of classic art, has fled before the camera invasion in the field of art.

Modern landscape is essentially original, and photography has helped it to its position. The phases it is assuming are due to the primary impulse of what the camera has demonstrated to be true and beautiful.

We may ask you, in conclusion, to note some of the modern landscape paintings of some artists, and their rendition of sea and sky, and then look back at what the greatest painters of the past have done and make comparison.

Can we not fairly claim that photography has helped to make modern landscape, even impressionism, what it is?

COLOR IMPRESSION

TO understand something of the difficulty attendant direct color impression, it must be observed that a very large portion of the color, which is exhibited in natural things, is not expressed photographically in a specific manner because of the amount of white light or radiated color light from the object. An object, for instance, which should send out red rays should not be expected to send those particular rays in their integrity to the sensitive film, even though the film should be made specially receptive to such rays.

The surface reflections must also be taken into consideration, which, in the majority of cases, are of white light, although other color impulses may also be radiated.

For instance, when the sun's rays face directly upon a stained-glass church window there is produced bright colored patches of light. These, when falling upon any colored surface, always produce an effect of color corresponding to that of the glass through which they pass. If a green patch of light falls upon a red surface the effect is still green, not red to vision, which shows that the red surface upon which the patch falls reflects some other light than red, white and probably complimentary green. For if this were not so we could not have exhibition of green, because it would be extinguished.

The proof is even more striking when the colored light falls upon a black surface. Here, also, a distinct coloration is visible, faint, to be sure, but the red is reflected back paler, so also the green, and this can be so only by virtue of the white light which is radiated from even a very black surface. Now it is this white light which usurps action on a sensitive plate, although the eye is not cognizant of its presence.

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Experiments with Paper Negatives

Some account has already been given in this JOURNAL of the use of the paper negatives which have recently been made in Germany as a substitute for glass on account of the expense of the latter.

A package of the negatives has been kindly given to the JOURNAL by Col. Steichen and the following is a brief account of the work done with them. The size is 4 x 6 (10 x 15 centimeters), being the so-called postal card size. Ten sheets are comprised in the package, which are accompanied by a sheet iron frame, with turned edges and a stout sheet of red cardboard. The brand is the Bayer "Plattenfort" ("away with plates"). As the size did not suit any of the plate holders at command, the use of the sheet iron holder had to be omitted and another method followed. This was to trim the sheet to the proper size—3.25 x 4—and place a sheet of glass in front, as the holder was of the form where the plate is inserted from the front. The sheet resembles dull-surface bromide paper. The picture taken was a photomicrograph of a section of plant stem. As the emulsion is orthochromatic, the procedures were conducted by green light.

The exposure was two minutes, under a Wratten red screen. The directions are that the papers must be soaked in an alum bath in order to prevent blistering, but as the hypo bath used is made up with chrome alum, it was not deemed necessary to make a special hardening.

A good negative was obtained, which was washed with a number of changes of water. It is directed by the makers not to use run-

ning water, which is, of course, a serious drawback to American workers, who are accustomed to the more convenient, though no doubt more wasteful, methods of continuous washing. The film, which is of gelatin, can be easily detached when the sheet is quite dry.

The method is interesting, and the manufacturers deserve credit for the work done in affording their customers a cheaper product, but the material has no practical value to American photographers, as the expense of dry plates has not increased enormously, and, further, the opaqueness of the paper is a disadvantage in the development, and the washing is prolonged and less satisfactory than with glass plate. The sheets so far tried have not shown any serious tendency to curl nor blister.

Trimming and Perspective

Every pictorialist knows how frequently a picture may be had by separating it from irrelevant surroundings, by use of the knife in trimming.

Anyhow, we have time out of mind called the amateur's attention to the possibility of extracting what Dean Swift calls "Sunbeams from Cucumbers," a picture from an association of things which in themselves do not make a picture, proving the absurdity that a part is greater than the whole. But the other day, while exercising this method of caution, we noted that the surgical operation, while improving the effect by concentration of interest to what only was of worth in the subject for some reason or other, produced an unnatural appearance in the view. On analysis, we discovered that in marking off the limits of the picture, we had inadvertently altered the perspective of the view.

The picture under treatment on the operating table, that is, the whole view, had originally been taken from a certain point of light, the point on the horizon of the landscape directly in front of the lens, and the photographer had managed the view between the right- and left-hand sides, so that the lines of the perspective converged to his point of view; or rather the accurate mathematical lens had done this for him. As a whole, the view looked proper when the spectator was allowed to assume the same position his camera had taken, but when we, in our scheme of improvement, thought to benefit his view by cutting off a part of the length of the view, while leaving

the opposite side intact, because forsooth, it had something in it artistically pleasing, we disorganized the original point of light and made the picture an impossibility, naturally.

As there happened to be a house represented in the scene, the effect of falsity was all the more pronounced, and we noted from other examples, that the greatest care must be taken when architectural features are exhibited in the picture.

In a good many landscapes, particularly where the horizon line is not pronounced, the disturbance is but slight if at all perceptible. An improper, or rather we should say "thoughtless," use of the rising front and swing back of the camera will also cause distortion of perspective in the same way, but cutting off the view more on one side than the other, throwing the point of right out of place from the standpoint of the camera, altering the relative dimensions of objects at equal distance from the eye if situated on opposite sides of the axis.

Now do not take this as a protest against "trimming" or an argument for disuse of swing back or rising front, all of which can be made valuable accessories for pictorial effect, but by way of advice to study what most you effect by the trimming and with an eye to preservation of visual perspective.

We might here caution the beginner to study what effect is produced when he elects to make a lantern slide from a portion only of a large negative, which amounts to the same as trimming a print. It is possible, of course, that he may take a part out which does not involve consideration of the point of sight without risk, but where it does he must look out, or the slide, when projected upon the screen, will look strange and provoke inquiry.

Relativity of Tone

The whole effect of light and shade in a picture, that is, the quality of the various areas composing it, causing the projection of one part against another, is dependent upon the proper perception of the relativity of tones—the relation of one tone to another in the unified conception of the subject.

If all objects on Nature were black and white, this perception of tone would be comparatively easy of cultivation. All that the student would need to acquire would be the ability to perceive the harmony of tones *en masse*, that is, get a unified perception of the picture as an entirety and not

in piece-meal; but the variety of shade of color in things, together with the additional effects on the initial color by reflection and inter-penetration of color, necessitates a close and accurate study of things in their mutual relationship so as to be able to appreciate the general harmony.

The decorative paintings by the Chinese and old school of Japanese artists often give delight by the presentation of this relativity of tone, so that one forgets the grotesque representations of the objects, and what harmony of blending of color is exhibited in a genuine Persian rug!

We once visited the studio of a painter of still-life subjects. He sat before his easel enthroned in the very heart of his kingdom of motley subjects. At his feet lay retainers of portly pots and pompous kettles in apparent unconsciousness of proximity to his majesty. The floor was strewn with more retiring and obsequious vases and bowls and urns, while here and there mingled with the throng a decayed aristocratic chair, whose shrunken limbs caused it to make respectful inclination toward the seat of power. The walls were covered with objects of every imaginable shape and color of the heavens above, the earth beneath, and waters under the earth, doubtless to the painter, very good, but to us seemingly very commonplace and unworthy of an artist's attention.

We marveled how a man of talent could take delight in such barren subjects. How dare he prostitute his high calling in bringing forth upon canvas, with infinite pains, these execrable shapes.

But we had not tarried long with him and looked at his numerous canvases ere we began to perceive in ourselves a growing pleasure in the marvelous effects of light and shade which his combinations evolved.

We lost sight of the realistic obtrusiveness of the things themselves in the perception of the delicacy and depth of the relativity of tone of the unification.

The pots and the pans and the kettles were but symbols whose association called for esthetic conception.

Here, then, was the secret of the painter's art and the reason for his delight.

When Reynolds painted his "Dido on the Funeral Pile," it is told that he put together billets of wood, covered them in part with rich objects he was introducing in his painting, and then placed his model on it in the attitude and in the dress of the expiring Queen of Carthage.

This was not from any want of imagination on Reynolds, nor with the mere intention of imitating all the minute details of the various objects, but because he knew that a degree of general truth and harmony of light and shade and color could thus be best secured in that it might suggest to him accidental beauties which might not have otherwise occurred to him.

Wilkie, in his earlier practice, often made small models of rooms that formed the scenes of his pictures with the proper doors and windows, and placed the general forms of his groups and furniture within, and did not think this any waste of time, for he knew that certain fine effects would be thereby suggested.

Really, no object in a group can be divorced from its surroundings in a general concept of a picture "each in each by mutual rendering."

We have our impression of things modified by surroundings and the artist knows how to give us a pleasing (instead of a distracting) impression by the way he brings things together.

He understands the law of modification by juxtaposition.

Film Pioneer Dies

It seemed as if Fate, as she sometimes does, had not played the game quite square in the case of W. Friese Greene, who died suddenly after addressing a meeting of the leading film men in England on May 5th, in his 66th year. For Mr. Greene, who was one of the pioneers of that industry, in which so many have made millions, died a poor man, having earned less from motion pictures than many a mediocre actor whose talent consists chiefly of following the director's orders faithfully.

As long ago as 1889 Mr. Greene invented a camera for taking motion pictures. A patent for his invention was granted in the following year. The newspapers of the day made mention of his invention and the more daring ones predicted that possibly a day might come when motion pictures of the Lord Mayor's show would be taken.

Mr. Greene's first picture, taken at Hyde Park Corner, was shown to a photographic society at Chester. Mr. Greene, however, believed that his invention might be of great value to the army in war time, and so he placed all the facts before the War Office. But he received no encouragement. So he went on experimenting and developing the invention, spending more than \$50,000 on

the idea. Finally he got to the point where his effects were sold at auction, and the tragedy of that event was that with the sale went much of the inventor's apparatus which was never recovered.

Later he turned his attention to color photography, but in this he did not meet with success, and in 1915 he was found to be living in a state of poverty. Through the assistance of Will Day and others in the motion picture industry he was helped out of his difficulties and a position was found for him with a color photographic company, with which he was connected when he died.

Henry D. Ward, aged 87 years, probably the oldest photographer in Massachusetts and mineralogist of recognized ability, died on June 5th in his home in North Adams, Mass., after a shock.

Born in Pittsfield, Mr. Ward took up the study of photography when a boy. During the Civil War he was the owner of a traveling photographic outfit and visited all of the principal army camps and did much work for the United States Government. At the close of the war he returned to North Adams and opened a studio in Main Street. He divided his time between photography and prospecting for minerals.

During one of his trips he found a huge lump of platinum, which at that time had no value, so he left it where he found it. A few years later when the value of platinum became recognized he returned to get it, but it was gone. He spent a small fortune trying to locate it, but was never successful.

His work as a photographer was with the old wet plate process and was among the best ever done, it is said, and many examples of his skill are to be found in the museums in Washington. He retired about five years ago.

The Many-Sided Safranin

Safranin seems to be assuming a position in photography similar to that which was assigned by the alchemists to the universal solvent, for which they are searching. Its power of desensitizing the unchanged silver salts without affecting materially the latent image has been exploited all over the world, and lately several new and important properties have been noted. Lüppo-Cramer pointed out in his early articles that it has a special energizing action on hydroquinone, so that in conjunction with that developer

the costly metol may be much diminished or even omitted. It now appears, according to a letter from him to the *Photographische Rundschau*, that a moderate amount of the dye will preserve the ordinary developer for a long while. The formula given is as follows:

Metol	5 gms.
Hydroquinone	7.5 gms.
Sodium sulphite, dry	50 gms.
Potassium bromide	1 gms.
Water	1000 c.c.

A 7 per cent. solution of caustic potash is prepared, to which are added 10 c.c. of the standard safranin solution for each 100 c.c. of the potash solution. The standard safranin solution is 1 part to 2000 of water. To prepare the developer for keeping, equal volumes of the potash-safranin and the metol-hydroquinone solutions are mixed. Lüppo-Cramer states that he has preserved such mixtures for seven months in bottles corked but only half filled. These were colorless glass containers, standing on the studio shelf, and occasionally struck by sunlight. No change in tint was noted nor any diminution of the developing power.

In this connection, mention may be made of a new desensitizer that has been placed on the market by a German firm. Apparently no explanation is given of composition. It is entitled "Ultinal." Tests made by Lüppo-Cramer indicate that it is somewhat similar in its action to the amidol solution that was first suggested. It is a clear, yellowish liquid, which for use is mixed with from ten to forty times its bulk of water. Its action is something like that of rodonal and the common paramidophenol solutions, for, according to the brief description, it seems that the preparation as sold is both a desensitizer and a developer. Lüppo-Cramer finds that it is applicable to the development of ordinary plates, but not to orthochromatic ones. Comparative experiments showed that development cannot be safely conducted with "ultinal" under the same conditions as with safranin. In an article elsewhere in this issue of the PHOTOGRAPHIC JOURNAL OF AMERICA will be found an abstract of a report of an elaborate series of experiments by Lumière Bros. and Seyewetz, showing that many substances have more or less desensitizing powers, but so far safranin leads all in practicability.

The "desensitol" furnished by the Ilford company has been analyzed by a German chemist, who reports to the *Photographische*

Rundschau that it is a solution of one of the forms of safranin.

The long preservation of developers has been the subject of investigation by J. Desalme, whose procedures are described at some length in a recent issue of *La Revue Française de Photographie*. The preservative recommended is sodium stannous tartrate. It is claimed that ordinary developers have been kept for years in partly-filled bottles without deterioration and that developers, which have become discolored, are bleached by the addition of a small amount of the solution. Desalme states that before the war some commercial ready-prepared developers were preserved with this material.

A New Photographic Journal

The Royal Photographic Society of Great Britain has begun the publication of a quarterly journal, *Photographic Abstracts*, being, as indicated by the name, a summary of progress in photographic science. The first number has just been issued. In size and general make-up it closely resembles the well-known official publication of the Society. The first number contains 32 pages. The list of subjects upon which abstracts will be furnished shows that the scientific side of photography will be almost exclusively represented. It is pleasing to note several examples of more rational spelling than often seen in British publications. Motion picture progress is to appear under the title "Kinematography," and such terms as "benzene" and "toluene" are employed in the text. The list of journals from which abstracts are to be made is quite a long one, and the new journal will be of great service to those who wish to keep abreast of the progress of photography in its scientific phases.

The Motion Film in Biology

The educational and research value of the motion picture has not received the attention it deserves. It is true that a large number of films are now shown to the public which represent natural phenomena, but in many cases striking effects are the primary object, and the scenes, though beautiful and often wonderful, arouse merely passing attention.

In a communication to the French Photographic Society, Dr. Comandon discusses this question at considerable length, and the following is an abstract of his paper as published in the *Bulletin* of that society:

Almost all of the phenomena of life are manifested through motion. An apparatus which records, reproduces and analyzes minutely and accurately these movements is eminently adapted for biologic research. The film is really a valuable scientific document, inasmuch as it preserves indefinitely phenomena or experiments which can be shown as desired to thousands of persons with an exactness and vividness not equalled by drawing or description.

The service of the motion picture is not limited to vital phenomena, for the author of the article showed on the screen the transformation of common phosphorus into red phosphorus, under the influence of light, a 'photo-chemical reaction. The following are some of the films shown which relate especially to the biologic phenomena.

Two films showing the influence of an electric current on certain infusoria. These orient themselves towards the negative pole as the magnetic needle does to the north, and are displaced towards this pole by a notable force. If the current is strengthened, the part of the animal turned toward the positive pole is violently contracted and may even break. The effect of ultra-violet rays was shown. These, as is well known, are invisible to the human eye, but strongly impress the ordinary photographic emulsions. To obtain any magnified views of objects under these rays, the optical train must be of quartz, including, of course, the slide and the cover-slip. The adjustment of the focus is made by the aid of a fluorescent screen. On account of the extreme shortness of these rays, the microscopic image has a degree of sharpness not usually obtainable with ordinary light.

The nucleus of living cells and the ordinary inclusions being opaque to ultra-violet rays, the photographs show details of structure that can be revealed under ordinary light only by staining processes. The rays have also a specific biologic influence, being capable of destroying the life of the cell-contents. Hence, when the ultra-violet light strikes a collection of organisms, we see their motion arrested, they contract strongly and then break. Such rays are dangerous to the eyes of the experimenter and great care must be taken in working with them. Fortunately, a protection is afforded by common glass.

The application of the film is not limited to passing movements or to those that are rapid. It can easily be applied to recording developments so slow that ordinary observation does not reveal any change. By

interrupted operations, extending over hours or days, the course of development may be analyzed and the entire period then compressed into a few minutes, or even seconds, so that an almost miraculous manifestation takes place. These procedures are fairly familiar now as part of the exhibition in the regular theaters, but the applications to scientific work, and especially teaching, have not been fully realized.

One point of special interest occurs in connection with the filming of biologic phenomena. It not infrequently happens that a teacher is unable to get, just when needed, a good example of a given vital action, such, for instance, as cell circulation or the division of some small organism, but it often happens that excellent instances of such are observed when there is no call for their exhibition. Now, by means of the cinematograph camera, if available in the laboratory, such typical cases can be at once filmed and thus preserved for future use.

Dr. Comandon and his associate, Dr. Pinoy, in this manner studied the motion of a Myxomycete, a very strange type of organisms, about which there has been much discussion among biologists as to whether they should be classed as animals or plants. They consist of a mass of protoplasm, with numerous nuclei, without membrane, and, therefore, have no permanent or typical shape. On a moist surface they move slowly by simply changing the shape of the mass. Photomicrographs were taken of one of these organisms every five seconds. By projection of the film the pictures were made to succeed at the rate of 16 per second, an acceleration of 80 times the original movement. By this means there was made evident a rhythmic character of the movement which escaped observation in the ordinary study. Acceleration of movements of human beings and the common animals are often produced on the screen, either for amusement or by defective conditions, but the acceleration of these slow living phenomena has a scientific value. Similarly, movements, the details of which are too rapid for our ordinary vision, can be studied by the film. Thus explosions, fall of bodies and motions of animals can be analyzed. Methods are now available for taking pictures at the rate of many per second, and thus the motion of projectiles, the flight of insects and other similar phenomena can be recorded. Northrup used, some years ago, the electric spark to secure extremely short exposures in the study of vortex rings.

Some strong effort should be made on the part of scientists to extend the application of the motion picture to research and teaching far beyond its present vogue, and, further, strong efforts should be made to introduce much more extensively than is at present the case, the slow-burning film, so that exhibitions can be made without the complicated accessories now obligatory.

Enlargements on Plain Paper

ENLARGEMENTS on plain paper are generally more acceptable to the colorist than pictures on bromide, although artists have gotten over the one-time difficulty of manipulation on an emulsion film, still very beautiful effects are secured on ordinary surface paper—the only drawback is in the line of photographic practice; that is, a plain surface print is not as sensitive and so demands greater exposure, but since the introduction of modern powerful actinic illuminants the comparative want of sensitiveness is not so serious an objection as formerly. There are a few methods, however, which make the plain surface more sensitive. The following will be found to work admirably with electric light illumination.

1—Mix 300 grains of ordinary starch with 16 ounces of distilled water; mix the starch first to a cream and then stir in hot water to the required amount. While still warm add—

2—Rock candy or loaf sugar. 10 grains
Tartaric acid 10 grains

3—Spread with a sponge or camel's hair brush the mixture of starch over the sheet of paper; with another sponge or brush, fine and damp, regularize or equalize the layer, removing an excess of coating.

4—Dry and keep the sheets free from dust and damp.

5—Sensitize as wanted, by means of a sponge, wad of cotton or camel's hair brush, free of metallic mounting, with a solution of—

Nitrate of silver 120 grains
Nitrate of uranium 420 grains
Water 2 ounces

Blend the surface as before. Dry and expose about a minute to arc light. Develop with—

Water 4 ounces
Ferrous sulphate 160 grains
Tartaric acid 80 grains
Sulphuric acid 20 drops

The image develops rapidly. Fix in hypo one part, water eight parts.—*Bulletin of Photography.*

Photographs on Porcelain by Direct Printing Without the Use of Collodion

A. J. JARMAN

Owing to many requests, we are reprinting the accompanying article, which originally appeared in the P. J. of A. some few years ago:

The production of photographs upon porcelain or opal glass was first introduced, in 1864, by the late G. Wharton Simpson, who produced a collodion emulsion of great sensitiveness, which could be used either upon porcelain plates, with a matt or smooth surface, or upon paper. Unfortunately, the prints produced by this process were fugitive; perfect toning and fixing did not add to their permanency, whether the surface of the plate had been ground or used in a smooth state.

It is possible and practicable for anyone to produce printing-out plates of good quality without the use of collodion at all, either as an emulsion or as a substratum. A suitable combination of the organic salts of silver for the production of prints on porcelain or opal glass will be found in the formulas hereinafter given, which produces an emulsion that has good keeping qualities and a high degree of sensitiveness:

Distilled water	1000 c.cm.
Gelatin	5 grammes
Citric acid	3 grammes
Chrome alum, solution	
(1-20)	50 c.cm.
Aluminum nitrate	2 grammes

Dry paper, then sensitize with the following:

No. 1.

Distilled water	100 c.c.
Gelatin	½ gramme
Salicylic acid	1-10 gramme

No. 2.

Distilled water	100 c.cm.
Green ammonia citrate of iron	20 grammes

No. 3.

Distilled water	80 c.cm.
Nitrate of silver	10 grammes

No. 4.

Distilled water	100 c.cm.
Uranium nitrate	20 grammes

Different tones may be had by varying the proportions.

To imitate platinum, black or grey, take:

No. 1	2 parts
No. 2	2 parts
No. 3	4 parts
No. 4	4 parts

Mix in the order given numerically. Pour a little pool on the centre of the paper and distribute over the surface with a wad of cotton or soft crash. Make even and light strokes to prevent streaks. All this, of course, is done under yellow light.

Print as with ordinary platinum paper and develop in the following:

Distilled water 700 c.cm.

Ferrous sulphate 30 grammes

Acetic acid 10 grammes

When developed sufficiently clear in a bath of:

Nitric acid 1 part

Water 100 parts

for three minutes and then fix in:

Water 1000 c.cm.

Hypo 180 grammes

Sodium sulphite 25 grammes

Sulphuric acid 3 c.cm.

Dissolve hypo and the sulphite of soda first, then add slowly the acid.

The developing should be carried to a considerable degree to allow for slight reduction in hypo.

Finally wash thirty minutes.

A very important point requiring attention is the cleanliness of the plate previous to coating. Any stain whatever upon the surface at the time of coating the plate with emulsion will present itself in an intensified form in the finished picture. Every trace of grease must be entirely removed, and the fingers must not be allowed to touch the surface to be coated, because the saline matters, together with the trace of oil, contained in the perspiration of the hands and fingers will show up when the print is finished. All that is necessary is to exercise ordinary care.

Procure a number of cut opal plates, both ground and smooth, known as pot opal, not flashed, the pot opal being solid white all through. These plates must be cleaned as follows:

Make up a solution of common washing soda in hot water, half a pound of soda to a gallon of water. After wiping off any dust or trace of the grinding material which may have been left upon the plates, lay them one on top of the other in the hot soda solution. Prepare a mop by tying a piece of clean rag on the end of a clean piece of flat wood. Take a plate by the left hand, rest one end upon the vessel containing the soda solution, and rub well all over both sides with the mop until it is seen that the plate is thoroughly clean. It may then be placed in a tray of clean water, and the operation repeated until all the plates have

been cleaned. If there should be one or two plates with streaks or marks which cannot be removed by this operation, it will be necessary to have at hand a small quantity of fine pumice powder. Dip a piece of wet rag into the pumice and rub well over the plate. It will be found that almost any stain will yield to this treatment.

Now prepare the following solution in a separate tray:

Muriatic acid (common) ... 4 ounces

Water 40 ounces

Take the plates from the wash water, lay them in this acid bath for a few minutes, and rinse them one by one in a stream of running water. Drain and place in a clean rack to dry. When dry, pack them face to face and away from the dust, as they are now ready for coating.

It will be necessary to prepare a leveling slab, which may be of slate, glass or marble. Arrange this slab upon a table, and level by means of a spirit level, using a few wooden wedges for adjustment. This slab should be kept as cold as possible. In winter the temperature will be sufficiently low; in hot weather it will be necessary to rub the slab over with a block of ice to cool it, wiping it afterward with a clean, non-fibrous towel whenever it is required for use.

The following emulsion should now be prepared:

Gelatin (hard) 2 ounces

Distilled water 5 ounces

Allow the gelatin to soak in the water for one hour, and get the following solutions ready to hand:

1.

Chloride of ammonium ... 40 grains

Distilled water 1 ounce

2.

Rochelle salts 50 grains

Distilled water 1 ounce

3.

Nitrate of silver 254 grains

Citric acid (powdered) ... 48 grains

Distilled water 5 ounces

4.

White alum (powdered) .. 90 grains

Distilled water 2 ounces

When the gelatin has soaked, place the stoneware jar or crock containing it into a saucepan of hot water, and bring it up to boiling point. Stir the melted gelatin well with a clean strip of glass; add the chloride of ammonium solution, stir; then add the Rochelle salts. The graduates which contained these solutions may be rinsed with a small quantity of distilled water. this

being added to the hot gelatin. The vessel containing this mixture must now be removed and taken into a room illuminated either by yellow light or by a gas jet, but not under a white light of any kind.

As soon as the temperature has lowered to about 125° F., the solution of nitrate of silver and citric acid may be added gently, stirring vigorously all the time. The alum solution should be made hot and stirred into the gelatin mixture. Ten drops of stronger ammonia may now be added, and the emulsion well stirred, the last addition being two ounces of pure alcohol (wood alcohol or Columbia spirit must not be used).

The emulsion being now prepared, it must be placed aside to set in a very cool place, an ice box, if possible, for twelve hours. At the end of this time remove the emulsion, now in the form of a block of stiff jelly, cut it into pieces with a bone knife or a piece of clean wood shaped like a knife, and squeeze it through a piece of coarse canvas, allowing the shreds to drop into a crock of clean water containing a few pieces of ice.

When the whole of the emulsion has been squeezed into the water it will readily subside. Pour off the water by covering the crock with the piece of coarse canvas, drain a short time; then repeat the operation twice more, meantime stirring the shredded emulsion well. This washing process is to rid the emulsion of all the soluble salts. After the third washing and draining the emulsion is ready to be remelted and used.

Take half of the washed emulsion, melt it in a clean stoneware pitcher by placing the pitcher into boiling water. When thoroughly melted and very hot, add to each pint one drachm of a solution of nitrate of silver, sixty grains to the ounce. Stir well, then add one ounce of pure alcohol; stir and filter through clean cheesecloth and absorbent cotton, or through absorbent cotton alone, if a funnel is employed having a bulb at the top end of the stem. The emulsion is now ready for use.

Have the plates at hand, the leveled slab cooled off, and a four-ounce graduate filled with the filtered emulsion. Take a plate by the top left-hand corner, pour a pool of emulsion in the centre; tilt the plate so that it runs first near the thumb and finger which hold the plate. Then allow it to run to each of the other corners. Drain the excess of emulsion into the graduate so that no air bubbles are formed. Retilt the plate so as to even up the film, and

place it upon the cold slab to set. As soon as a number of plates have been so coated, place them in a clean rack, back to back, with one small space between, leaving a double space between face and face of the other plates. Place these racks in a ventilated drying closet or in an ordinary darkened room. It will be found that the plates will be dry in the course of twelve hours. As soon as they are dry they may be stored in packages face to face, ready for use.

Any emulsion left over must be reserved in a small covered crock in an ice box, but should be used up within two weeks.

Printing may be carried out with any form of porcelain printing frame; or it may be accomplished by binding the prepared plate to the negative at the bottom edge by means of stout gummed paper. A temporary hinge is thus formed, and the printing may be carried on in an ordinary printing frame, examination being made by removing the back of the frame and turning the porcelain plate back. If not sufficiently printed, the paper hinge will permit the return of the plate upon the negative without shifting.

When the print is made it must be well washed in clean water to get rid of the free nitrate of silver, as in printing on any print-out paper. It may then be toned in a good gold toning bath, the best results being obtained with the borax bath or one containing acetate and bicarbonate of soda.

The combined toning and fixing bath must not be used under any circumstances, although this kind of bath will tone these porcelain prints quickly and to any color. Prints so toned, however, will quickly fade. Separate toning and fixing in clean, freshly made hypo should be the method adopted. After fixing, and a few minutes washing in running water, the plate may be put into an alum bath made of two ounces of powdered alum to a pint of water. Be sure there are no crystals left in the water, or white specks will be formed. After the alum bath wash well for an hour, and dry. When dry the plate may be varnished or not, according to the taste of the individual worker.

Remarks on Fixers

Like many of the technical terms used in photographic manipulation, the designation of fixation is a misnomer, because actually the substance employed in the so-called process does nothing in the way of fixing anything. One might, with much more pro-

priety, for accuracy in nomenclature, call "development" of the latent image "fixation," for the chemicals employed to operate upon the molecular disturbance in the film, incident upon exposure to light influence, actually do fix a condition of equilibrium by the formation of the visible image, but the "hypo," the typical fixer, does nothing more than eliminate the parts of the film not acted upon by light, by dissolving out chlorides, bromides, iodides, etc.

The "fixing agent," as we must continue to call it, must be of such a character as not to exercise any injurious effect upon the reduced parts of the sensitive film, while removing the unaffected portions. That is, it dare not attack in any way the formed image, had by development.

Sodium thio-sulphate is the proper name for our "hypo" and nothing has been found quite so effective, or quite so kind in its disposition in handling the work it is asked to do. Its discovery and application by Sir John Herschel was a boon to photography and an impulse to its rapid progress.

There are other chemical bodies which do the fixing act, but none like hypo.

Concentrated solutions of the chlorides of ammonium, sodium and potassium, etc., dissolve chloride and might be used to fix films made with this particular halide-silver. They have the disadvantage, however, of forming double salts, which crystallize by evaporation, and besides are very tardy of action.

The iodides and bromides were tried, before hypo was employed, but they, too, do the work imperfectly, and, moreover, are high priced. In some of the processes for direct color photography, hypo has been found to act inimically upon the integrity of the color obtained, and so practically undo the work of the experimenter, and so it is well to know of these other fixers which may be more considerate in the treatment of color work.

A peculiarity in the action of potassium iodide is, owing to the fact that the double salt forms iodide of silver and potassium, which is not soluble, even with prolonged washing in water, but subject thereby to decomposition. It must, therefore, be kept in mind that only concentrated solutions of potassium iodide are adapted to fixation process.

The same is the case with the use of the chlorides.

Cyanide of potassium is a very energetic agent. It also forms double salts, soluble in water, but not decomposed thereby. The

objection to its use is, just by reason of the over-energetic action. It does more than is called for, and does harm. It attacks the image. Sometimes this energy can be utilized. Its solvent power may even be increased by addition of iodine, which may be used to remove the entire deposit, as a reducing agent, for the retoucher.

The sulpho-cyanides easily dissolve silver halides. When used for paper prints in conjunction with the salt of gold chloride, we have an effective tone-fixing solution, which gives good results when judiciously handled. For this purpose it is often preferable to toning and after fixation in hypo, because there is little or no reduction of the original image.

We all know our friend the enemy, hypo, but we do not all appreciate how to properly treat it.

We blame results on its conduct, when the odium should fall upon what we burden the hypo with in its legitimate performance. The novice will tell you the fixation is delayed because his hypo was weak, when in reality the tardiness is due to concentration. A saturated solution will refuse to thoroughly fix the film. The film may be also attacked by strong solution, that is, the gelatin decomposed. Plain hypo is efficient in itself. Alum sometimes works hostilely in conjunction. If there is fear of action on the film during hot weather, use formaldehyde.

Clouds in Autochroms

It is generally known that one of the weak points of the Autochrom process lies in its rendering of cloud effects, and very few, indeed, are the transparencies seen with really good sky renderings. Of course, this is largely caused by the smaller margin of latitude in exposure allowed by the Autochrom plate. Cloud formations, when very distinct, may sometimes be retained if a very exact exposure is given, and if care is taken not to develop the plate too far in the first bath, the requisite density and brilliancy of color in the transparency being obtained by intensification. This plan, however, is more or less risky. A good way of preserving cloud forms is to paint over the sky portions of the plate with 10 per cent. potass. bromide solution, using a sable brush very lightly charged with the solution. This should be done before the time of development as a whole is half complete. This is not an easy matter in the dim Virda light, though it should be remembered that by the

time development has reached the stage mentioned the plate has lost much of its sensitiveness, and no harm will result if quite a bright light is used, provided the plate is not held too near. This method applies only in part to sunset sky effects, when, as a rule, the exposure is made with a view to including the clouds only, the landscape as part of the subject being of little importance, its effect being for the most part suggestive, as a silhouette foreground. Yet this must not be overdone, or an untruthful effect will be produced. Unless the landscape foreground is a very open, distant one, no details of it should be hoped for, since the quality of the sky effect would of necessity be sacrificed. In sunset sky effects, compromise with regard to exposure could be productive of successful truthful, or even convincing, results, and the usual exposure rule should be reversed to suit the case, viz., "Expose for the high-lights, and let the landscape take care of itself."—*British Journal of Photography*.

British Weights and Measures and the Metric System*

Faced with a demand in certain quarters for the compulsory adoption in Great Britain of the Metric System, the Conjoint Board of Scientific Societies appointed a Committee to report on, not the theoretical advantages of the metric system which are indisputed, but the necessity of making it compulsory in this country for all intents and purposes. The British system of weights and measures has grown unscientifically almost from prehistoric times, and the system itself, as well as the use which has been made of it is unnecessarily complex and wasteful of time and arithmetic. Its defects, indeed, are so obvious that there has been for many years strong propaganda in favour of its eradication. Bodies such as the Decimal Association have assumed that the metric system is undeniably superior, and have perhaps made light of the very real difficulties of a change. With every increase in complication of technical processes and the establishment of each new scientific industry, it has been almost natural to work in the metric system, which became so well known in our factories and machine shops during the war, that the time was undoubtedly favorable for a radical change in our units of measurement.

* Note on the recent Report on compulsory adoption of the Metre System, by the Secretary of the Committee.

Nevertheless, the Committee of the Conjoint Board, have, after long and careful consideration, confirmed the opinion expressed by Lord Balfour of Burleigh's Committee on commercial and industrial policy after the war—that it is not desirable to make changes compulsory, except perhaps in one or two special trades.

It cannot be denied, that many scientific men, as well as propagandists, consider this verdict thoroughly reactionary. It is therefore worth while to examine the question with some care. The Metric Committee point out in their preamble that the terms of reference—the advisability or otherwise of compulsory adoption—removed the question out of the purely scientific sphere, and made it necessary to consider the effects in common life as well as in technical manufactures and industries.

They point out the great distinction between measuring and making to measure, the latter being in ordinary life far more common than the former. In the greater part of common manufactures and small trades it is a case of making, often rather roughly, to a few given dimensions, or of weighing and measuring to one or other of a relatively few units. The British units are not well related, and especially they rarely have decimal relations, but such as they are they are well established and perfectly standardised. When reformers speak of confusion in British measures they must mean either complexity in relations, or confusion in use, for there is no confusion in the measures themselves, as there was between the different varieties of foot and pound in Central Europe little more than half-a-century ago, or as there is to-day in the varying values of the maund in different parts of India. The British pound and foot of unvarying standard are thoroughly established in the world, and no one has the slightest difficulty in knowing what they mean. But they lend themselves ill to calculation, owing to the fact that the various units are not inter-related decimally, which makes them totally unsuitable for any scientific work, and far from convenient in any technical work, such, for example, as the simple process of making up a photographic developer. All this is common ground. Nevertheless, the Committee came almost unanimously to the conclusion that for the ordinary purposes of life the metric system is not superior to the British system, since it does not lend itself readily to the ingrained habit of subdivision to

halves and quarters, a habit which no decimal system is strong enough to conquer. Moreover, the Committee believes that the advocates of a change have not paid sufficient attention to material difficulties. The trouble of changing all the weights and measures in the country would be trifling compared with the difficulty of providing all the sacks, barrels, glasses, jars, boxes, etc., which would be required if all sales were to be made in metric weights and measures from a given date. They point out that the inconveniences of a change of system are felt in each individual transaction, and that the quantity dealt in is relatively unimportant. The retail trade in small quantities would feel the weight of the change. It does not appear to the Committee that any changes desirable in the units of weight in the foreign trade require the abolition of the avoirdupois pound as the unit of weight in the internal retail trade of the country. A change in the unit of length immediately interferes with all standard sizes and fits, which would inevitably be perpetuated almost indefinitely alongside the new. For reasons such as these, which are fully set out and discussed in their report, the Committee recommends that the British system of weights and measures be retained in general use in the United Kingdom, but that serious attention should be given to their decimalization and to the elimination of those which do not lend themselves readily to this purpose. They suggest, for example, the abolition of the pole, furlong, and the league, and the limitation of the link and chain to use in the determination of area; the abolition of the square rod or perch and the rood, all areas of land being in acres and decimals, or in square feet. In the measures of weight they propose the abolition of the grain, drachm, stone, quarter, and cwt. of 112lb., and the complete abolition of apothecaries weight. In the measures of capacity, they suggest the general use of the gallon, with the customary subdivision into quarts and pints for retail use; the abolition of the peck, bushel, quarter, chaldron, and barrel, and the substitution of measure by weight. Finally, and this recommendation is as important as any, they insist on a more sensible use of the remaining measures, by confining each statement of measure to one unit—75 inches, for example, instead of 6 feet 3 inches—and the more extended use of the central and thousand-weight, which are already much employed in certain indus-

tries. In one trade only, that of drugs and fine chemicals, does the Committee recommend the immediate compulsory adoption of the metric system. They recognize to the full, however, the inadequacy of the British system in all scientific and technical processes, and they suggest that reform in these should be brought about gradually, by agreement on the part of Government Departments, large companies, and contractors; to issue specifications and invite tenders in the metric system.

A draft of the Committee's report was submitted to the Constituent Societies represented on the Conjoint Board and their criticisms are printed in full. The purely scientific societies, such as the Physical Society, the Faraday Society, and the Royal Society of Edinburgh, express strong dissent from the recommendation; while the technical societies, such as the Electrical Engineers, the Engineers and Shipbuilders in Scotland, the Institute of Metals, Mining Engineers, Naval Architects, and others, are in general agreement.—*Chemical News*.

Checking Back on Quality

Even the man who is doing good average work will do himself good to now and then put himself through school again.

The best of professional men do such things to keep out of the ruts. Your physician takes a few days or weeks off to attend a course of lectures. And while you can brush up on ideas in the same way, the only way you can brush up on actual practice is to go through a series of checking up experiments in your own studio.

Obviously, the things we are going to suggest can not be done when making sittings for your customers. But they can be done in your spare time just to keep yourself from skidding to one or the other side of what you know to be the peak of your ability to produce work that is technically and artistically good.

And while you are putting yourself through school again you may find it will be to your advantage to also put an apprentice through the same training. You can teach him in a very short time what it might take him months to absorb. And the sooner he learns fundamentals, the sooner will he pay you dividends in good work as your assistant.

He should get his training in composition in an Art School or from the simple rules that are to be found in text-books.

But lighting is a bit more difficult. The eye must be trained, not only to see an effect of light on the subject, but to also approximate what the film or plate will record.

The ground glass is practically useless for this purpose. The image is always pleasing as it is seen on the ground glass because of its color. But it does not represent what the sensitive material will record.

It is best to forget the ground glass except as a means of focusing and placing the image in the proper space. The effect of light must be determined independently. The eye must be trained to determine the value of highlights as they will be reproduced by the negative and print.

The use of artificial light simplifies matters considerably because the light is sufficiently constant to make the duplication of a result fairly certain. You train your eye, not so much on the strength of the light on the subject as upon the relation of the lights to the shadows.

The important thing in lighting the subject, as you know, is to maintain a harmonious balance of light and shade. It is light and shade that gives roundness to the photographic image. Put too much light in the shadows or too little light in the highlights and the result is flatness. Reverse the procedure and there is too much contrast.

Be your own schoolmaster, make your studio your school and check back against yourself just to be sure that the quality of your work is not slipping.

If some of the suggestions we make seem absurdly simple, just remember that they must be elementary. We all know them, but we sometimes slip up a bit in our judgment because they are so simple.

One of the first things to consider in lighting a subject is the value or strength of light. The strength of light diminishes very rapidly as the distance from its source is increased. If you place the subject 6 feet from the light and make a correct exposure in 2 seconds, at 12 feet the exposure must be 8 seconds.

The light decreases in inverse ratio to the square of the distance from the light. The rule refers to a point source of light but, practically, it applies sufficiently well to a greater volume of light to be used in judging exposure.

The square of 6 is 36—the square of 12 is 144, which is 4 times 36. Therefore, any

exposure at 6 feet must be multiplied by 4 to secure the same result at 12 feet from the light.

Next comes the balance of light. After placing a subject at 6 feet and 12 feet from the light and noting the difference in illumination, load your holders for the first practical lesson. Make two exposures on a film to economize, as the results can be seen on a small negative as well as a large one.

First, make a strong lighting that you know will produce deep shadows. Have the light come from an angle of 45° and from a point sufficiently in advance of the subject to just touch the cheek bone on the shadow side when the subject is facing front.

Make an exposure as nearly correct as possible without using any reflector to throw light into the shadows. Get your impression of the strength of light and depth of shadows with your head in approximately the position of the lens.

Now have someone open a screen further in advance of your main source of light so that some light will fall into the shadows, or use an auxiliary light, not too strong, at a sufficient distance to slightly illuminate the shadows. Note carefully the effect of this light and make another exposure.

Next, use a head screen close to the subject to reduce the highlight alone and note what effect this has in balancing the lighting. The reduction of a highlight that is too strong will make the shadows seem lighter in comparison. Make another exposure.

In each of the last two instances the change in the effect of the lighting should be very small. Don't overdo things or the comparison of the final results will not be of sufficient value.

For the fourth negative, use a reflector at a considerable distance from the subject to put a small amount of light into the shadows. Make a fifth and sixth negative moving the reflector slightly nearer each time.

The value of such experiments is in noting the effect of each change in the appearance of the lighting. You have made some of the lightings too flat and some too contrasty. You have made one that you think is just right.

When the negatives have been developed and your printer has given you the best possible print from each one, you can readily tell whether or not the lighting you thought

just right produced the negative that made the best print.

If it did not, your judgment was wrong and you have learned something worth knowing.

If you have made notes at the time of making the exposures so that you can duplicate the experiments, you can make a second series of negatives very closely approximating the best results of your first experiments. The hardest thing may be to admit that you have been wrong in your judgment and to set a new standard.

So much for the balance of light. Now for the best technical quality. You have a very fair idea of exposure. But you may be wrong. Under-exposure is a common fault.

With a certain lighting you may consider 2 seconds a normal exposure. If so, make four negatives giving exposures of 1, 2, 4 and 8 seconds. Mark the time on each and develop all for the same length of time with the developer at 65°.

You may find that you are slightly under-exposing. Don't judge by your negatives. Judge by the best prints the negatives will produce. You may find your 4 seconds exposure will produce a print with more depth and roundness than you have been getting from your negatives. You may not like the looks of such negatives, but just remember that it's print quality that counts. You get business on the quality of the work you deliver.

So much for exposure. Now for the effect of time of development. You may see a greater difference in the effect of development than in the effect of exposure. Several negatives of varying exposure, developed for the same length of time, will have the same contrast. But a variation in the time of development will make a variation in contrast.

Make about six exposures and have them as nearly identical as possible. And if you have been developing for 8 minutes, place all the negatives in a tank at the same time, but take No. 1 out in 6 minutes, No. 2 in 7 minutes, No. 3 in 8 minutes, No. 4 in 9 minutes, No. 5 in 10 minutes and No. 6 in 12 minutes.

Again, you can not judge the best result by the negatives. Don't try to. Give the six negatives to the printer and tell him to get the best prints from each negative. Mark the prints to correspond with the negatives but choose the best print before you look to see what time of development that negative received.

You may find you can improve your results by more careful development. The negative which had 8 minutes development may not produce the best print.

It takes time and patience and material, but you can improve your work if you go about the task systematically and analyze each series of experiments. It's worth the effort, too, because the only way to see results is by comparison.—*Studio Light*.

Snapshots

FRANK FARRINGTON

Too many holidays may put a crimp in your business, but too few of them will put a crimp in your constitution.

We don't like to be criticized, but neither do we like to take medicine. Criticism of our work is likely to do for our business what the right kind of medicine will do for our system.

When you can't pay a bill the day it is due, say so. Take it up with the payee and arrange for an extension, instead of taking the extension without any arrangement and thus spoiling your credit.

The photographer who tries to get the best of a patron will start that patron trying to get the best of him, and it's no cinch that the photographer will come out ahead.

When a "friend" wants his note endorsed, offer to lend him the money if you want to, but don't take the responsibility of endorsing him.

You might possibly win a prize in a lottery by the guess method, but you will never make good photographs working that way.

If your letterheads and billheads are sloppy or inartistic-looking affairs, you are deliberately using them to give your studio an undesirable reputation.

Be businesslike in collecting accounts as well as in paying them. Otherwise, you will find people taking advantage of you and you won't be able to get even by taking advantage of folks you owe, because they will not allow it.

Everything you waste is so much out of the possible profits of the business. This is a day when it isn't profitable or popular to be wasteful. Waste not, want not.

One of the most wasteful forms of wasting is that which is mere carelessness. Carelessness wastes material, but it does not stop there, it wastes reputations.

Nobody likes to do business with a stingy man. You needn't be prodigal beyond your means, but don't let patrons catch you being stingy.

Stripping and Transferring Negatives

Even the most careful of operators will occasionally crack a glass negative, when it becomes desirable to remove the film, and occasionally it also becomes desirable when working in carbon or allied processes which require a reversed negative.

Stripping may also be used to enlarge a film, so that it is almost possible to make a half-plate negative from a quarter-plate.

Assuming that it is required to strip and transfer a negative film to another support without enlargement one may use the following:

Methylated spirit	1 oz.
Water	2 oz.
Hydrofluoric acid	60 minims

Immerse the negative in this and after a few minutes it will be found possible to coax up a corner, and the film can then be loosened all along one edge and gently rolled up until it is quite free from the glass, and then transferred to a dish of clean water and spirit in above proportions, and finally transferred to another glass.

If the film is to be enlarged, then use—	
Hydrofluoric acid	1 oz.
Citric acid	1 oz.
Glycerine	1 oz.
Acetic acid	4 oz.
Water	32 oz.

The longer the film is left in clean water after stripping the greater the enlargement, but beyond a certain point the gelatine becomes so thin that it readily breaks, and naturally the density is reduced as the silver particles are driven farther and farther apart.

Hydrofluoric, or fluoric acid, as it is sometimes called, is nasty stuff to handle and keep; it must be kept in a rubber bottle, and readily attacks the nails, eating them away and causing painful sores. Precisely the same results can be obtained by using the fluoride of potassium or sodium and decomposing it at the moment of use with an acid; about 20 grains of each per ounce will suffice.

A method of stripping without the use of a fluoride at all is as follows:

Soak the negative in—	
Formaline	1 oz.
Glycerine	300 minims
Water	10 oz.

for fifteen minutes, rinse for a minute, and dry. Then cut through the gelatine about one-sixteenth of an inch from the edge, and immerse for fifteen minutes in—

Sodium carbonate	2½ oz.
Water to	10 oz.
Do not wash or rinse, but immerse in—	
Hydrochloric acid	60 minims
Water	10 oz.

and as soon as the film lifts transfer to clean water, and thence to glass.

Precisely the same method may be adopted for stripping the film of celluloid negatives.

Whilst there may be no difficulty in getting the film to adhere to a perfectly clean glass, it is just as well to use glass which has been flowed over with thin gum water or thin gelatine solution. One may also use any old negative or spoilt plate which has been freed from the silver or silver salts by soaking in fairly strong hypo and ferricyanide reducer and then well washed.

If a reversed negative is required, the stripped film must of course be turned round; that is to say, the side which was previously next to the glass must be now away from it.

Although there will not be much difficulty in getting the film to settle down comfortably and straight in its new home, it can, if covered with waxed paper, be gently squeegeed or rubbed down with a soft linen pad, or even coaxed down with a flat, soft brush.—*Amateur Photographer & Photography.*

Ultraviolet Rays Disclose Secrets of Old Parchments

Much of the lore of ancient palimpsests—parchment manuscripts from which the original writing has been erased and written over at a later date—is about to be laid bare by the mysterious power of ultraviolet light, says *Popular Mechanics* for June. Previous to 1914 the discoverer of a new method of using the rays, a Benedictine monk of the Bavarian order, had made such progress that many of the ancient parchments in the Benedictine Abbey of Wessobrunn had been made to disclose their secrets. In principle the new method is quite simple, being based upon the peculiarity, possessed by many organic substances, of fluorescing—glowing with a pale canary-colored light—when brought under the influence of the invisible ultraviolet rays. The old parchments possess this property to a remarkable degree, while the ink of the older writings upon them, containing ingredients insensible to the action of the rays, remains dark and forms a contrast of sufficient intensity to register clearly on a photographic plate.

An Addition to Photographic Journalism

From the "City of Pleasant Breezes," the fourth in size in the western hemisphere, comes a new venture into the photographic field, "Foto-Revista," published monthly at the capital of Argentina. No. 3 is the issue before us, presumably for March, but the month is not indicated. Exclusive of cover, it contains forty pages, about ordinary magazine size, including a considerable number of advertisements, and some photogravures. A feature that will give us pause is the announcement, in a prominent place, of a "German Society of Photographic Amateurs," which it seems dates from 1917. This is simply one of many indications of the extensive and well organized German influence in Spanish-American countries. The article seems to be one of series, as it is entitled, "Our Institutions."—H. L.

A Procedure for Preparing Transparencies

The *Monatshefte fuer Photographie* describes a method for using discarded negatives, especially on films, for the preparation of transparencies, which is a modification of method known as the Thiébaud procedure. The negative is treated with a reducing solution—such as Farmer's—until all the silver is removed, well washed and dried. It is immersed for a couple of minutes in an alum bath, rinsed well and sensitized with the following solution:

Water	200 c.c. (6 fl. oz.)
Ammonium bichromate	18 grm. (300 grains)
Copper Sulphate, cryst	8 grm. (120 grains)
Manganous sulphate, cryst	3 grm. (50 grains)

This gives a contrast effect. By diminishing the proportion of the solid ingredients, a somewhat harder result is obtained. The immersing in the solution must be continued until the gelatin has taken up a full amount, which will require from one to two minutes, and to prevent further absorption the film should be promptly drawn through a dishful of water, after which it is dried, of course in the dark.

The film is then exposed under the desired negative until the high lights are printed, after which the liberated chromium salt is washed out, preferably with warm water. The image is weak and yellowish, and is further developed by immersion in one of the following baths until the desired tint is obtained.

For dark green tones

Water	100 c.c. (3 fl. oz.)
Pyrocatechin	1.5 grm. (20 grains)
Acetic acid	5 c.c. (1 fl. dram)

For reddish brown tones

Water	100 c.c. (3 fl. oz.)
Acetic acid	5 c.c. (1 fl. dram)
Pyrogallol	1 grm. (15 grains)

By addition of 1 grm. (15 grains) of pyrocoatechin, the tone is materially darkened.

For brown tones

Water	100 c.c. (3 fl. oz.)
Paramidophenol	1 grm. (15 grains)
Gallic acid	2 grm. (30 grains)
Alcohol, 90%	20 c.c. (5 drams)
Alum	1 grm. (15 grains)

These developers have fairly good keeping qualities. After the development, the film is well washed.

Several points of advice are given by the describer of the process, which involve nothing new to experienced photographers, but it is stated that if the exposed print is insufficiently washed before the development, a positive instead of a negative will result.

The strength of the acetic acid is not given, but it is presumably the commercial dilute form known commonly in English-speaking nations as No. 8.

Photographic Bas Reliefs

Prof. Namias recommends the following method of making gelatin bas reliefs, which may be employed in reproducing gypsum or metallic casts. The negative employed must be of some intensity and contrast of light and shade to give the best effect. The principle is founded on the nature possessed by gelatin to swell up in presence of water. A slight relief is frequently noticed in an ordinarily developed gelatin plate, particularly when pyro is the developing agent. The method by Namias gives a good high relief. It depends upon the property of the hardening of bichromated gelatin when exposed to light.

The following solution is made:

Gelatin	20 gms.
Gum Arabic	10 gms.
Water	1000 c.c.
Acetic Acid (Glacial)	1 c.c.

The addition of the acetic acid serves as a preservative to the mixture.

A clean plate of glass is carefully leveled on a table, and the above mixture, after being carefully warmed in a water bath to make it fluid, is poured over the horizontal plate to form a coating from 2 to 3 mm.

thick. It is allowed to set and then put in a vertical position and dried in a moderately warm room, free from moisture. When thoroughly dry, the prepared plate is immersed in a 3 per cent. bath of ammonium bichromate, to which ammonia is added, until the orange tint is changed to yellow, practically this is converting the bichromate into chromate.

The plate is thus made sensitive to light, but it requires an exposure of half an hour to strong sunlight to receive an impression under the negative. The rays of the sun should be as near vertical as possible. The preparation keeps well in the dark and may be kept ready for use a long time.

The printing furnishes a good strong relief on washing in water, to which alum has been added. The addition of alum prevents softening of the film. About 2 per cent. of alum is sufficient; a small quantity of acetic is also found advantageous.

The plate is left in the alum water for several hours and the relief is then apparent and the whole film possesses good resistance when dry.

The matrix so produced may be employed in making a gypsum or plaster cast, or it may be coated over with plumbago and a metal deposit had by use of the battery.

Quinine as Reducer, Intensifier and Toner

The M. M. Lumière and Seyewetz report further experiments of the use of quinone and other oxidizing agents for the intensifying and reducing.

Very few organic oxidizing agents have been applied to these operations, and of a consequence such application is of much interest to the practical, as well as the scientific, photographer.

As early as 1910 these investigations called attention to the use of quinone as a reducing agent. The similarity of its action in this particular is not unlike the behavior of the potassium persulphate reducer.

The formula recommended is:

Benzo quinone	5 gms.
Sulphuric acid	20 c.c.
Water	1000 c.c.

The action upon the film is not immediate, requiring some minutes before penetration of the film is effected. The denser parts are first reduced, which is a decided advantage. Rinsing of the plate under the tap arrests further action and preservation is effected by submitting the plate to a 20 per cent. bath of sodium sulphite.

Extension of the use of quinone was made subsequently to intensification and to toning. Benzo quinone, as well as its sulphonate in conjunction with a bromide or chloride, was used.

The plain quinone gives greater density than the sulphonate, and the bromide better results than the chloride.

A.

Quinone	5 gms.
Potass. bromide	25 gms.
Water	1000 c.c.

B.

Sodium quinone sulphonate.	10 gms.
Potass. bromide	25 gms.
Water	1000 c.c.

After the intensification or toning, immerse in 10 per cent. solution of ammonium, sodium or potassium carbonate, each of which communicates a distinct variety of tone. The method is excellent for toning lantern slides.

Vigorous Prints on Plain Paper

The varieties of gelatine or collodio-chloride papers (P. O. P.) have a wide field of application and are, probably, best suited for general work, but where special, artistic results are desired the experimenter wishes for some method of exploiting his individual aspirations.

It is necessary that he know the peculiar constitution of his sensitive surface, so as to emphasize the particular qualities of his negative. Plain silver paper has always been a favorite with the aesthetic photographer, but unless the surface contains some colloid like gelatine, collodion, gum or starch, it is difficult, if not next to impossible, to obtain bright prints except from strong negatives, the image being more or less sunken in and flat. Increasing the gelatine and adding a little chrome alum to harden it betters results, but it is hard to get even coating.

The method of plain silver printing, worked out by G. H. Moss, of England, and published some years ago in the *British Journal of Photography*, solves the problem of getting an inexpensive and at the same time most beautiful photographic results.

The main peculiarity of Mr. Moss' process is that no gelatine or albumen or starch enters into the preparation of the sensitive paper beyond that which may be already in the body of the paper, as sized by the manufacturers. Thus all the unstable combinations of colloids with the silver salt are avoided, or so small in quantity as to be

considered negligible. The difficulty was to obtain vigor and keep the image on the surface without the aid of the colloid vehicle. After many experiments, Mr. Moss adopted the following formula, which we can endorse from personal experience.

Salting solution:

Sodium chloride (C. P.)

(not common salt) 150 grains

Ammonium chloride 100 grains

Potassium bichromate 4 grains

Water 20 ounces

The small quantity of bichromate gives the vigor desired, so if you work with very thin negatives, add a little more, and if your negative is hard reduce the amount.

Whatman's ordinary paper or any good drawing paper is soaked in this salting solution for five minutes and hung to dry.

Sensitizer:

Silver nitrate 400 grains

Citric acid 150 grains

Water 10 ounces

Float the surface of the paper on this solution for two minutes, taking care to avoid air bells. The sensitized surface has a light primrose tint.

This paper is very sensitive, and should be kept from unnecessary exposure to light. Print rather deeper than you would desire the finished print to look.

Tone in any ordinary P. O. P. toning bath, but dilute about one-half. Wash well after toning and fix in hypo (1-10) for ten minutes for thin paper and twenty minutes for heavy paper. Wash for an hour after fixation.

Landscape and Long Focus

There are many who advocate the exclusive use of the long-focus lens for landscape; the general consensus being that the picture so taken is much more pictorial than when a shorter focus is used. There is no disputing the fact that in very many instances lenses of as long a focal length as can be well used will make the better view, for the reason, chiefly, that the forced perspective, or, in other words, linear distortion is in a great measure avoided. The objects represented relatively have more the appearance they present in the sketches by artists. This is all good and true, and no one will deny the advantages gained by a long-focus lens and the artistic distraction encountered when a short focus is used; but, at the same time, one should guard against pinning his faith down to any formula. We shall find not a few exceptions.

In using a long-focus lens, our foregrounds are apt, in some instances, to appear too far off, or, rather, we seem to feel the want of nearer foreground than we get in photographing many picturesque objects, we make a great gain by using a comparatively short-focus lens, because we are compelled to go so close up as to separate that which we wish to make the principal feature from what is back of it. We have found this to be especially the case in photographing trees. By a near point of sight, the background objects are so thrown off and diminished that they do not interfere with our main feature, and it stands out boldly, and we do not, in this case, have any apparent distortion on account of the perspective, as would show up annoyingly, if architecture were the feature.

The photographer should exercise judgment and make allowances, and not pin his faith to one lens, which his experience has taught is admirable in certain cases.

A New Positive Paper

The *Deutsche Lichtbild Kunst* gives a brief account of new positive paper invented by Himmelsbach, a photographer of Davos. The composition of the basic material is not given, and the principal claim made is for cheapness, it being stated that the cost is about one-fourth that of the ordinary grades of paper. For the preparation of it a good quality of paper stock is necessary, which must not be weighted with barium salts. The paper is coated with a mixture of three solutions, by the brush or by pouring, and then dried. It is sensitized by floating or immersion in a silver solution. This sensitized paper is said to keep for about three months. The general effect is that of matt albumen paper, but it has better keeping qualities and the image is in general superior. In printing, care must be taken not to overexpose, as the subsequent treatment will not reduce the image. Gold toning is not necessary. The well-washed paper is toned in a very weak platinum bath and then fixed in a slightly acid hypo.

Light-Sensitiveness of Collodion

Dr. B. HOMOLKA, in a paper in *Photographische Korrespondenz*, deals with the phenomenon of sensitiveness to light possessed by pyroxyline, as observed many years ago by Gladstone and Hofmann. The action of light is to liberate extremely minute quantities of nitric acid. The reac-

tion which takes place requires the use of a highly delicate test for nitric acid, such as is now available in the substance 9-aminophenanthrene. By the use of this reagent the decomposition of collodion in sunlight, with formation of nitric acid, can be quickly and plainly shown. If a sheet of baryta paper, coated with a collodion film containing this substance, is exposed under a negative, a positive of red color is immediately obtained, and may be fixed by dipping in benzene in which the aminophenanthrene is soluble, whereas the compound formed from it by reaction with nitric acid, viz., 9-9'-azoxyphenanthrene, is insoluble.

This experiment can be made as follows: A mixture is made of 10 c.c.s. alcohol and 10 c.c.s. ether, in which is dissolved 1 gm. of 9-aminophenanthrene and 0.2 gm. of citric or other non-volatile organic acid. The filtered solution is mixed with 20 c.c.s. of 4 per cent. collodion and coated on baryta paper. Exposed under the Chapman Jones plate in diffused bright light for a minute or a minute and a half, a red positive print is obtained, and can be fixed by one or two successive dips in benzene.

The experiment may be done in a different way, allowing of the production of a visible from a latent image. The baryta paper is coated with a pure collodion film without addition of the aminophenanthrene and, when dry, exposed under the negative. No visible change is produced, but a kind of latent image, owing to the greater or less loss of nitric acid by the collodion film in the exposed portions. If the exposed sheet is saturated with a solution of aminophenanthrene in benzene and again exposed after drying, but this time under a clear glass plate instead of a negative, there appears a negative in red, that is to say, a duplicate of the scale of tones used for the original printing. The experiments show that the decomposition of collodion in sunlight comes within the possible conditions of print-out processes, and cannot be neglected. While perhaps its photographic importance is limited, the phenomenon provides an interesting comment on the use of collodion for the protection or decoration of metal articles. Owing to the production of nitric acid by exposure to light, the collodion coating may give rise, in a much worse form, to the very evil which it is intended to prevent.—B. J.

Recent Patents

1,377,184. *Light Projection.* Projection apparatus comprising means for producing a concentrated beam of light having substantially parallel rays and having rays which are not parallel with said rays, a transparent reflector obliquely disposed in the path of the beam of light at such an angle that the parallel rays make substantially critical angles of incidence with the reflector so that a part of one class of rays is transmitted and a part of the other class of rays is reflected, the parallel rays being so separated from the non-parallel rays as to produce a beam sharply defined on at least one side.

1,378,462. *Motion-Picture Apparatus.* The combination with a driving shaft carrying a shutter, a parallel shaft carrying a film-feeding drum, and an adjacent plate parallel to the shafts and having an exposure opening across which film is fed, of two mutually engaging gears on the shafts, respectively, a projecting lens lying between said opening and the shutter, and means for deflecting to the lens light coming through the opening.

1,378,208. *Camera.* The combination with a camera having a back provided with a focusing opening, adapted to register with openings in a film backing, a ground-glass positioned within said camera and over said opening, flat springs carried by said camera back and engaging said ground-glass to normally hold the ground-glass in engagement with the camera back out of the path of said film, and guards carried by said ground-glass plate and extending over said springs to prevent engagement of the film backing with the springs.

1,378,101. *Photographic-Printing Apparatus.* In a photographic-printing apparatus, the combination with a guide for a sensitized strip and a printing negative arranged therein, of a movable presser for holding the strip and negative in printing contact, a marker adapted to act upon the strip and controlled by the movement of the presser, and an indicator with which the mark made on the strip is adapted to co-operate to indicate the feed of the strip.

1,379,396. *Apparatus for Perforation of Cinematographic Films.* In an apparatus for perforating films, the combination of a punch, a die, a guide-pin for advancing the film, a head on which said guide-pin and

punch are mounted, and means for imparting circular movement to said head carrying said punch and guide-pin so as to cause said punch and guide-pin to both perforate and by steps advance the film.

1,379,086. *Camera Attachment.* In a camera shutter operating mechanism, the combination of a cylinder, an air-compressing piston in said cylinder, a piston rod having a cylindrical portion adjacent the piston, a square portion beyond and a cylindrical portion beyond the square portion, a square opening in the head of said cylinder to guide the piston rod and prevent rotation thereof, a spring for actuating said piston to compress air in the cylinder and to give partial rotation to the piston rod, a valve for permitting gradual escape of compressed air from the cylinder, a lateral projecting pin on the piston rod for maintaining the piston in a retracted position and adapted to pass through a slot in the piston head, and a trip arm connected to and movable with said piston rod to operate the shutter trigger.

1,378,936. *Shutter Mechanism for Cameras.* A camera shutter comprising two curtain sections arranged end to end, rollers to which the remote ends of said sections are attached; tapes fastened to the free end of one section, passing around guides on the free end of the other section and extending back lengthwise over the first section; a roller to which the other ends of the tapes are fastened; and gearing between the tape roller and the roller to which is attached the curtain section to which the ends of the tapes are fastened; the parts being so proportioned and arranged that the tapes are wound up and unwound more slowly than the curtain section attached to the roller to which the tape roller is geared so as to increase the size of the shutter opening during the opening movement of the shutter.

1,374,875. *Sensitive Material Marking Device.* The combination with a camera, of a sensitive material marking device therefor, comprising a medium positioned adjacent to the sensitive material in the camera and having a writing surface and a luminous portion, said writing surface being interposed between the sensitive material and the luminous portion, and means for controlling the exposure of the sensitive material to the action of rays emanating from the luminous portion of said medium.

1,374,235. *X-Ray Photographing Appliance.* In an X-ray photographing appliance, the combination with the operating table, of a frame longitudinally adjustable upon the table and adapted to support the patient, and a plate-holding member supported on said adjustable frame and longitudinally and transversely adjustable in relation to said frame.

1,376,913. *Projection Apparatus.* Projection apparatus comprising a light source having at least one substantial dimension, a reflector positioned rearwardly of the light source with a portion of its reflecting surface on each side of a horizontal plane through the light source, and a reflector positioned forwardly of the light source with a portion of its reflecting surface on each side of said plane, the two reflectors being shaped and positioned with their foci axially spaced apart and with the focus of the rear reflector substantially in the light source, so that light is projected in and below a horizontal direction without projecting substantially any light upwardly.

1,377,099. *Photographic Printing Machine.* A photographic printing machine comprising a box, an apertured partition in said box and providing a plurality of compartments therein, a lamp in one of said compartments, a negative receiving holder in the other compartment, an operating lever mounted to swing on the box, a presser member mounted to swing on the box and suspended from the operating lever to be operated therewith, a translucent closure normally closing the aperture in the said partition and a means between said lever and said closure for operating the latter to uncover the aperture upon swinging said lever to move said presser member into active position, said means including an angularly movable device, a roller thereon, and an element carried by the lever for imparting partial rotation to the roller.

1,377,916. *Camera.* In a camera of the character described, a frame, means for holding a film in the frame, a glass for receiving an image, a single lens coating with said glass and with the film, a rectangular guide for the lens, said guide being formed with a slot, a lever mechanism having a part extending through said slot and engaging the lens for shifting the same from in front of said glass to in front of the film, and back again to its original position, and a shutter operated after said lens has reached the exposure position in front of said film.

Intensifier for Autochroms

The *British Journal of Photography* speaks favorably of the autochrome intensifier recommended by Albert David in the *Photo Revue*. It gives satisfactory results and in no way alters the colors. Prepare the following:

Potassium bichromate ..	20 grams
Hydrochloric acid	20 c.c.
Water	1,000 c.c.

This is a preliminary bath and is staple; it may be kept indefinitely.

The plate is immersed in the solution until the image disappears or takes on a faint yellow color. This takes place in from 30 seconds to one minute. The plate should not remain in the bath for more than the minute's immersion. It is removed, well washed and placed for half-minute in the following solution:

Sodium bisulphite lye	3 c.c.
Water	100 c.c.

It is kept in this bath until the image becomes white upon a dark ground. It is not safe to leave it in the solution over 30 seconds. After another wash it is developed in full daylight in—

Amidol	0.5 grams
Sodium sulphite (dry)...	1.5 grams
Water	100 c.c.

Develop to full intensity. The plate is finally washed and dried. Fixation is not necessary.

Measuring Gloss or Mattness

HERR K. KIESER has described in the *Chemiker Zeitung* a method and instrument for rating the surface, as regards gloss, or mattness, of photographic papers. The process is based on the property of rectilinear polarization of light. The degree of gloss is measured directly by the angle of rotation of the analyzer of a Martens polarimeter. The surface to be measured may be slightly colored, a somewhat bright coloration increasing the degree of gloss, apparently in correspondence with the proportion of black in the colors. Highly glossy photographic papers yield, by this method, a value of 30 deg., equal to that of glass. Those of semi-glossy surface yield a figure of about 20 deg.; matt papers, about 10 deg. In the case of papers of dead matt baryta surface, the figure may be as low as 1 or 2 deg. Uncoated papers of fine surface are rated at from 3 to 12 deg. The instrument for these measurements has been made by Messrs. Schmidt & Haensch.—*B. J.*

Operating for Photo-engraving Process.

By C. J. Killen. 2d edition. Price, \$1.50. Boards. Bissell Colleges, Effingham, Ill.

In the small compass devoted to the subject, the author has simplified the various methods and brought the information, technical and scientific, to the understanding of the beginner in the art, a thing much to be desired and often neglected by more extensive treatises.

The actual practical knowledge, with the requisite amount of dissension of theory, enables the learner to understand and better apply the principles involved.

Nothing of importance to a thorough comprehension of the subject is omitted. The chapter on half-tone screen and stop manipulation is particularly illuminating. Additional value in the treatise will be had from the well-selected formulas for practical performances, the product of actual practical experience.

Many of our readers will learn with regret of the passing away at Saranac Lake, N. Y., of Frederick B. Taylor, who for several years has been afflicted with an incurable disease. In spite of his suffering and the knowledge that he could never get well, he accepted his lot with great fortitude and without complaint.

Mr. Taylor, as most of us know, was an enthusiastic amateur photographer, and was a contributor to this and other magazines. His interest in this direction was a source of much pleasure to him and was maintained until the very last. His wife and one son survive him, and to them we extend our heartfelt sympathy.

The Eastman Kodak Co., of Rochester, wins in an interesting test case, determined by the Board of United States General Appraisers, involving a question of the correct tariff classification of merchandise described as "ecrans."

These articles, consisting of two sheets of plain glass having a coat of gelatin and balsam between them, intended to be attached to the square frame of a camera, and used in taking pictures in colors, were assessed with duty by the collector at the rate of 30 per cent. ad valorem under the provision in paragraph 95 for manufactures of glass.

In an opinion by Judge Sullivan, the customs board finds that duty should have been levied at the rate of but 15 per cent. ad valorem as part of a camera under paragraph 380.

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PHOTOGRAPHING BIRDS' NESTS—
L. W. BROWNELL

ONE of the easiest branches of Nature photography, and yet one in which there are enough obstacles to overcome to make it extremely interesting, is the photographing of birds' nests. Furthermore, it is the branch that offers more opportunities for artistic results than any other, with the possible exception of flower photography. If one but takes the trouble to thoroughly study his subject before making an exposure, to observe from what point of view the best lighting and general effect is obtained, the resulting picture will often be something for the creation of which he need feel no shame.

A bird's nest is something that will not run or fly away; therefore, one need be in no hurry when photographing one. Look at it through the camera from every direction before finally deciding which will give the best effect, for, while photographs of birds' nests are primarily valuable from an ornithological standpoint, there is no reason why one should not try to make the photograph artistic as well. It will not detract from the scientific value.

All this, naturally, applies to those nests that are built on the ground or near it, and, fortunately, the majority of nests are in such positions. Those that are placed in trees, on the edges of cliffs and in like almost inaccessible places, are usually capable of being photographed from but one direction, if, indeed, one is fortunate enough to be able to photograph them at all.

It must be remembered, primarily, that a picture of a bird's nest, to be of any real value, must show as much of its surroundings as possible, and, at the same time, show plainly the detail of construction and the manner of attachment to its support. It should also show the eggs, or, at least, some of them.

Let me say before going further that, in working at this branch of photography, we should always remember that the birds have a greater right to their nests than we, and we should therefore use every effort not to disturb the nest sufficiently to cause the birds to desert it. For this reason, and also for the reason that by so doing the most natural results may be obtained, it is imperative that the nest be always photographed in situ. This is easy with those that are built on or near the ground, but those that are built in trees, especially when they happen to be at the end of some branch, are the ones that tax the ingenuity of the photographer.

With almost any nest it will be found necessary to arrange the surroundings somewhat. Some leaves, grasses or small branches will often be found in front of the nest, and will need to be cut or pressed aside before an unobstructed view of it can be obtained. In doing this, greatest care should be observed that the modifications of the original arrangement of the surroundings be as little as possible, and, above all things, that these do not show in the picture. Should it be found necessary to cut off a twig, cover the cut end with a leaf, and it is always advisable, when possible, to bend back the branches or herbage rather than cut or pull up. They can then be restored to their original positions after the photograph has been made and the nest left just as it was.

When photographing the nest of one of the ground builders, one should first press back or cut off all the foliage that intervenes between it and the point of view he has chosen. Place the tripod with the tilting top at a distance of from two to two and a half feet from it, and pointing downward at an



CHIMNEY SWIFT'S TWIG-FORMED NEST, FASTENED TO INSIDE OF CHIMNEY. L. W. BROWNELL



"THE BISHOP"

F. J. MORTIMER, F.R.P.S.

From the Exhibit at The Camera Club, New York

angle toward it. The tripod should be made to stand as close to the ground as possible by spreading the legs, so that a good view may be had of the outside as well as inside construction of the nest. If the nest is so deep that the eggs are hidden from view, when looked at from this angle, they may be raised by inserting a small tuft of cotton beneath them. In doing this, great care must be used that no particle of the cotton shows and that the eggs lie in the same relative positions as originally. This is almost always with the smaller ends together. Never point the camera directly downward at a nest, for this not only gives an entirely false view of it, but also of the outer construction or the surroundings as they should be shown.

Focus should be made on the rim of the nest nearest to the camera, and the lens stopped down until everything is in sharp focus. This often necessitates a small stop and a resulting long exposure, and so one must wait until none of the surrounding herbage is in motion. The nest should always be shaded from the direct rays of the sun, so that the results will not be too hard and much of the detail lost. The ideal day for nest photography is one on which there is no wind blowing and with the sky slightly overcast.

In the matter of exposure, it is well to err on the side of over- rather than



THE BLUEBIRD'S NEST IS BUILT IN A NATURAL CAVITY
IN A TREE. L. W. BROWNELL

under-exposure, and so I always give a little more than the time I think necessary. The exact time to give under all the different existing circumstances is something that can only be learned by experience. As a general rule, however, using as a basis an exposure of one-eighth of a second, with the stop wide open and doubling this for every smaller stop used, will give fairly accurate results.

All this is applicable only to the tripod outfit. One can, of course, use the hand camera, and, with care, obtain very good results. Naturally the image will, in most cases, be smaller, and also, as an instantaneous exposure must be given, the full sunlight will be necessary, unless the camera is fitted with one of the faster lenses. Any leaf or other object that casts a shadow on the nest should be removed. The portrait attachment should be used and the camera held as near the nest as its type will allow. It should be held at a height of between two and three feet so as to get the proper angle. The arrangement of the surroundings and of the nest itself should be the same as when the tripod is used. Anyone well acquainted with the proper manipulation of a hand camera, if he uses the proper care, may obtain excellent nest pictures, and, even though the image of the nest be small, if it is sharp it can always be



BLUE-WINGED WARBLER, PLACED IN THICK HERBAGE
ON GROUND. L. W. BROWNELL

enlarged. The F. P. K., with the attachable ground-glass back, makes a most excellent camera for this work, for it is light and convenient to carry and can be used on a tripod.

Those nests that are built in the bushes from one to four feet above ground are, naturally, the easiest subjects. In using the tripod, the legs should be made sufficiently long to elevate the camera from six inches to a foot above the level of the nest. If the nest is placed so high that this cannot be done with the ordinary tripod, sticks may be cut and bound to the end of the legs. I have, on occasions, made my tripod legs ten or twelve feet long in this manner, and have done my focusing sitting or even standing on the shoulders of an assistant. All the advice given for the lighting and arrangement of the ground nests applies here. The exposures, however, should in most cases be slightly shorter, as a nest in a bush is usually rather better lighted than one on the ground.

In the case of a nest that is swung at the end of a branch, one must be content to wait until he is fortunate enough to find one not more than twelve or fifteen feet high. Under these conditions the branch may, usually, be bent down and fastened within easy photographing distance of the ground. Care must be taken to prop the end up so that the nest will be sure to hang in its original position.

Naturally, the nests of the tree builders offer the greatest obstacles, but these obstacles are such as can, in many cases, at least, be overcome by persistence and ingenuity, and the overcoming of them forms one of the greatest pleasures of nest photography. The photographing of nests in trees is not an



THAT DAINTY, DIMINUTIVE, CUP-LIKE NEST OF THE RUBY-THROAT,
NEAR END OF HORSE-CHESTNUT LIMB, THIRTY FEET ABOVE THE
GROUND. L. W. BROWNELL

entirely safe job and I should never advise any but those who are expert climbers to attempt it, for the hands, necessarily, must be occupied exclusively in the manipulation of the camera, leaving entirely to the feet and legs the task of maintaining one's hold in the tree.

Two methods can be used for securing the camera in the tree. The legs of the tripod can be securely lashed to several of the smaller limbs or branches, or the camera can be fastened directly to one by means of the ball and socket clamp. The latter method is by far the easiest and most satisfactory, although there are occasions when it will be found necessary to use the former.

For work upon the nests of tree builders, I am of the opinion that a hand camera is often preferable to one of the tripod type, especially if the camera should be a Graflex. The surroundings are not so apt to need so much arrangement, and, particularly with the nests of the large birds, the hawks, crows, eagles, etc., one can get sufficiently far away to have the surroundings all in good focus, even with the lens wide open, and still have a fairly large image of the nest. Moreover, as it is often next to impossible to shade the nest in any event, the increased light will allow of stopping down the lens to even the second or third stop and obtaining a well-exposed negative with an exposure of about 1-25th of a second, especially with one of the faster lenses.

Nest photography is not only a fascinating pursuit, but is also a most important part of the science of oology, for by no other means can the nests of our birds be properly depicted.

I sincerely trust, however, that no one will attempt it without a thorough regard for the rights of the birds. Let one collect all the photographs of nests that he can, the more the better, but in so doing let him give the rightful owners as little cause for complaint as possible.



THE GREEN HERON'S ROUGHLY BUILT NEST OF TWIGS, FORTY FEET ABOVE GROUND IN A SWAMP MAPLE. L. W. BROWNELL

THE CITY AS A PICTORIAL FIELD— WILLIAM S. DAVIS

THAT appreciation of the pictorial material to be found in cities is growing among camera workers is evidenced by the more frequent appearance in the magazines and exhibitions of pictures derived from this source, but, notwithstanding, there are still many city dwellers in the ranks of the cameraists who are neglectful of the pictorial mine at hand, and only take out their outfits when an opportunity is found to visit the country. Some who follow this practice doubtless believe desirable subjects are only found by getting away from town, but others who acknowledge the possibility of turning city material to pictorial account claim the available subjects don't appeal to them.

To those in the first class, I can only say, if you are not acquainted with your environment, try going about in an investigative spirit, not only when a little spare time can be found, but by selecting different routes in going to, and returning from, business—walking a part of the way if the distance is too great to cover entirely afoot in a reasonable time. As to personal preferences: though one's taste may lie in the direction of rural scenes, it is a mistake to ignore all other subjects, for while specialization doubtless makes for a better understanding of a chosen field, and stronger work, it is likewise liable to cause a narrowness of outlook and monotonous repetition of ideas when taken too far; consequently, this fact alone should be an incentive to cultivate a broader field.

How many, I wonder, who cover a beaten path in their daily routine fully realize the variety of subject-matter to be found in any fair-size city? While the range varies with the location and size, all towns will furnish material for street scenes, desirable architectural studies, outdoor genres, landscapes in the parks, industrial compositions and such traffic subjects as railroad terminals and train-yards. If located upon a waterway of commercial importance, whether it be a river, lake or seacoast harbor, additional material of importance is found in the shipping, piers, bridges, etc., as well as more or less striking glimpses of the city from the water.

Any of the subject-matter mentioned will yield a diversity of compositions. Take, for example, street scenes. A general view from one viewpoint is greatly affected in its aspect by variations of light and shade at different hours, constant changes in the grouping of traffic, atmospheric conditions, as when the distance melts away in a fog, or showers cause reflections upon wet pavements, while after sundown many such subjects present interesting twilight and night effects under electric lighting. In winter a fresh fall of snow completely transforms the scene, whether viewed by day or night. All these factors do not exhaust the possibilities of varying the nature of pictures based upon city streets, for a little search will enable one to discover "bits" here and there, either in the streets or adjacent to them, such as a team of truck horses drinking from a watering trough; typical figure types, including such habitués

as street venders, bootblacks, etc.; fountains and public monuments, with attractive sculptural detail worthy of attention, and entrances of buildings possessing a distinctive character.

What has been said regarding the streets applies in the main to other material, notably the architectural field, since every city possesses some buildings of special beauty or historic interest which can be made the objective point of a picture, while others that may not be quite satisfactory when viewed in their entirety will provide material for detail studies of parts, such as colonnades, doorways, a tower or spire against a striking sky, and interior views, and the fact should not be forgotten that snow, mist and artificial illumination, as well as variation in the angle of lighting from the sun, all affect the aspect of a building as much as other subjects.

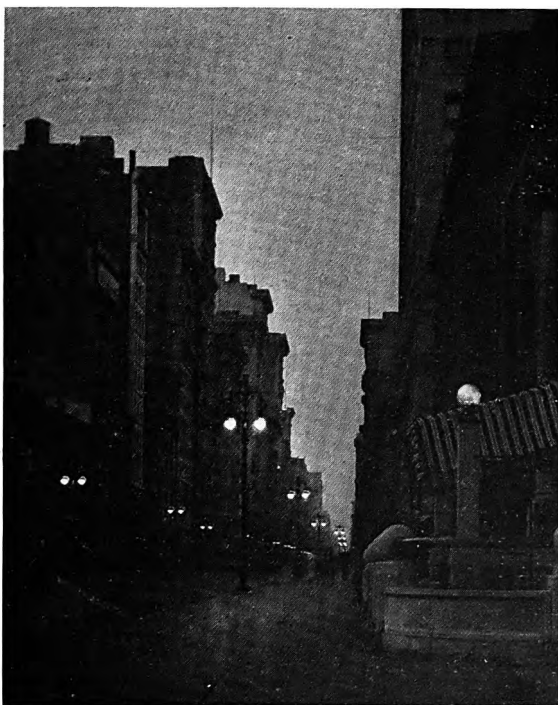
The pictorial element in various industries are better appreciated by artists now than was the case but a few years ago. The strength and picturesqueness of such subjects as tall stacks pouring forth swirling clouds of dense smoke, giant cranes moving castings in a foundry or shipyard, the building of a "skyscraper," and network of tracks in a train-yard, with the switching engines making up trains, have been demonstrated, but so far such material has not been worked to the point of becoming hackneyed by any means, though to obtain effective composition it is of course necessary for the worker to grasp something of the significance of the subject-matter chosen. Force, and a certain dramatic quality, is generally felt in connection with any large undertaking, like those mentioned, and this calls for bold treatment of the pictorial composition—broad masses of light and shadow, together with just an element of mystery in the rendering of some portions to give the imagination a chance to work. In other words, what is called for is an interpretation rather than a literal rendering of every detail.

It is the way material is used which largely determines the success of a picture; consequently, an ambitious worker will learn faster how to secure a good composition by acquiring the habit of regarding the prospective subject in terms of light and shade. If the combination of tones possesses strength and unity of effect a successful picture is possible, but when harmony is absent failure is a foregone conclusion, and having a "pretty subject" won't alter the result. As so much often depends upon transient arrangements of light and shadow, it is never wise to condemn a subject which looks unpromising upon first acquaintance, for under different lighting or atmospheric conditions the entire aspect may be transformed for the better.

So far as technical considerations go, the city worker is likely to adopt the type of instrument and method of manipulation which experience proves best suited to individual needs. For many phases of the work a tripod camera, or one of the styles of hand camera which permit of visual focusing, can be used with advantage, especially when dealing with architectural subjects and many parks scenes, and for night work a solid support for the camera is, of course, essential, even though the lens is set by scale. When working amid crowded traffic, or in making studies of any kind requiring rapid manipulation

to catch the combination of shifting elements at an opportune instant, a good hand camera is absolutely necessary. The type is mainly a matter of taste, many giving a reflex the preference, but I believe in most cases fully as perfect results are obtainable with a good pocket camera, which is very much lighter and easier to use; the great depth of focus-at-large apertures possessed by the lenses fitted to miniature cameras greatly simplifying the problem of focusing, for while the user of a reflecting camera is enabled to focus up to the instant of exposing, this fact does not make possible obtaining good definition throughout various planes, but only upon the point the operator may decide upon as being most important. To combine the advantages of both types to the greatest degree a small reflex should be used—say $2\frac{1}{2} \times 3\frac{1}{2}$ or $3\frac{1}{4} \times 4\frac{1}{4}$.

As an all-around instrument, the writer has had success with a $3\frac{1}{4} \times 4\frac{1}{4}$ plate camera similar to the usual folding style, fitted with an $f6.3$ anastigmat of six-inch focus, the adjustments including reversible back, swing and rising front. This, together with a steel tripod, makes a reasonably light and handy equipment, which has been used upon such diverse subjects as interiors and



"TWILIGHT—FIFTH AVENUE." WILLIAM S. DAVIS

This shows the lower end of the famous New York thoroughfare, looking north, at 6.40 P. M. on an August evening. The traffic at this time is comparatively light, so by waiting until the foreground was free from moving pedestrians, it was possible to give an exposure of 10 seconds without the blur in the distant figures being very noticeable, especially as they were not moving across the field of view. The lens was used at full aperture of $f6.3$, and the negative (on an instantaneous Iso plate) showed plenty of shadow detail for such an effect.

snapshots from a motor-bus. A lens of larger aperture than this would be useful for badly-lighted street scenes, but unless of a shorter focus (as fitted to smaller instruments) the lack of depth would many times limit its use wide open.

A direct-vision finder is a valuable addition to any type of hand camera, particularly when photographing street and harbor scenes, because of the ease with which the subject can be observed and the fact that movement of objects outside the angle of view can also be watched, thus avoiding the sudden intrusion of a figure, or other object, close to the lens just when the shutter is released.

The top of a "bus" affords an excellent vantage point from which to secure pictures of a crowded thoroughfare, choosing a seat at the extreme front or rear, according to the direction one intends to point the camera in relation to the traffic and lighting conditions. If too slow a shutter is used, vibration from the engine, as well as sudden jolts, will affect the technical quality of the results, but sometimes a desirable arrangement of material is presented at a moment when a stop is made, thus avoiding jolting as a factor. A shutter



"ON FULTON STREET, NEW YORK." WILLIAM S. DAVIS

Made in bright sunshine at 9.35 A. M. on an August day, exposure 1-25th second, stop $f6.3$. Cramer instantaneous Iso plate. In a narrow street, lined with high buildings, the sun must be fairly high to give sufficient illumination for snap-shooting.



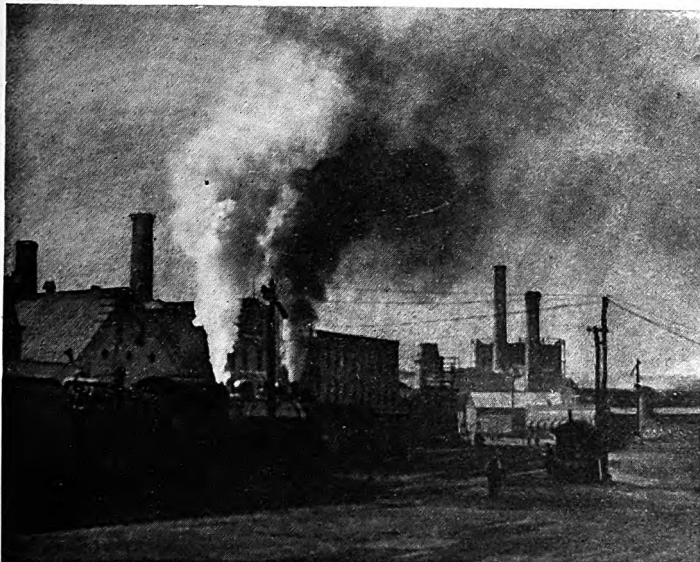
F. J. MORTIMER, F.R.P.S.

From the Exhibit at The Camera Club, New York

"IN THE THICK OF IT"

speed of from 1-50th to 1-100th second will generally give satisfactory results. If the light is good and the street quite open, *i. e.*, not shut in by very high buildings casting deep shadows, sufficient detail in the shadows can be secured on fast plates or films with a lens aperture no larger than $f8$, but usually it is a decided advantage to work with a larger opening than this, since the local color of many buildings, dark colors of most vehicles and heavy shadows, all call for additional exposure to secure good tonal gradation. Most street scenes in the timing of the exposure might be classed with "landscape with heavy shadows in foreground," but of course one must be guided by local conditions, which are far from uniform. When there is no fear of the camera being jarred during the exposure, a slower shutter speed may usually be employed, 1-25th second being quick enough to "stop motion" of ordinary traffic when not closer than fifty feet from the lens, *providing* it is not passing directly across the field of vision, as is sometimes the case at the intersection of two streets. Most street views are taken in perspective, however, which reduces the apparent motion of the traffic.

In composing a street scene, one should try to secure a viewpoint showing a diversified sky-line, and sufficient gradation of tone to avoid monotony, one side in sunshine and the other in shadow sometimes being a desirable combination. Where the traffic is near enough for the individual units to be prominent, a division of interest among two or more groups of vehicles or pedestrians should be avoided, and some care may be necessary not to have the nearest so close as to appear exaggerated in size. While there is an element of luck about



"THE TRAIN YARD." WILLIAM S. DAVIS

Made on the waterfront at New London, Conn., at 4.15 P. M., on a July day, hazy sunshine. Exposure 1-25th second, stop $f11$, single Achromatic lens, instantaneous Iso plate.

getting all these factors right at the same time, especially when working from a moving viewpoint, it is at least possible for the photographer who elects to work from the sidewalk, or steps of a building, to bring the stationary elements into satisfactory relationship—also choose the time of day when the lighting is most satisfactory, thus leaving the traffic only to be considered. Good grouping of the latter is more likely to be secured when one has a clear idea in what portions of the composition the figures and vehicles should be located to give the best effect, then by exercising patience, one is almost sure to see the right combination form, or at least something which will approximate to that in mind. One pictorialist is said to have waited four hours during a severe snowstorm to secure just what he wanted. Fortunately, such an extreme test of patience is seldom demanded of the photographer.

Rain and mist are often helpful elements with various subjects, as the first causes reflections upon the wet pavement that are useful in breaking the monotony of a flat foreground, while mist increases the apparent depth of perspective by differentiation of tone and simplification of detail in receding planes of the scene. The light refracting power of fog and mist also increases the proportionate luminosity of the shadows, thus reducing the chances of getting harsh contrasts.

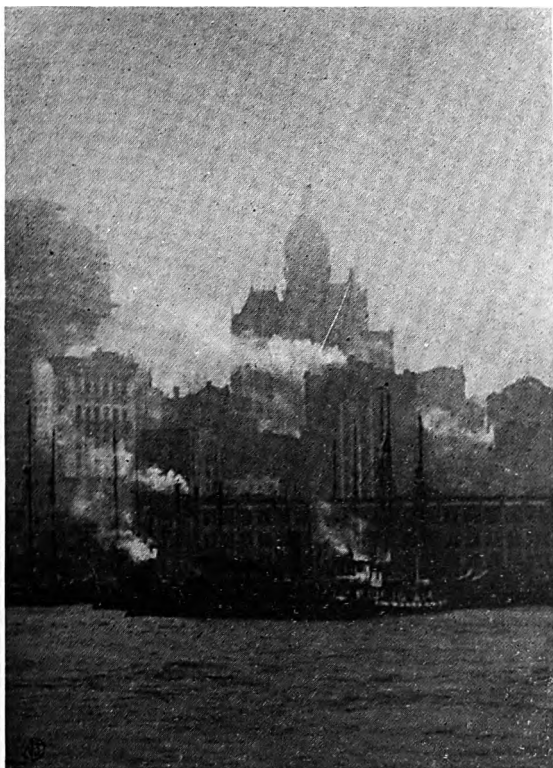
Pleasing effects are obtainable at twilight, soon after the street lights are turned on, and with considerable shorter exposures than have to be given after night has fully set in, a few seconds being sufficient to secure the detail visible



"BROOKLYN BRIDGE—EARLY MORNING." WILLIAM S. DAVIS

The viewpoint for this was the deck of a steamer which had just made fast to the pier, so motion was not a factor, but an exposure of 1-40th second gave very good gradation with a lens aperture of $f11$ at 5.50 A. M. in August. This was taken with a single Achromatic lens.

to the eye, but to show strong effects of reflected light and cast shadows it is necessary to wait until the daylight has quite faded. Exposures will then range from about five to thirty minutes when using a lens aperture of $f8$ and fast films or plates (the latter should be double-coated, or backed, to reduce halation), according to the intensity of the illumination and nature of the subject-matter. Open arc lights should not be included in the foreground, unless some opaque object intervenes to cut off the direct rays from the lens. The most troublesome feature while exposing is excluding lighted cars in motion. Passing pedestrians can be disregarded, as they leave no impression, providing they keep in motion. When a lighted car is seen approaching, a piece of card should be held before the lens until it has passed, and, when such interruptions are frequent, the total period of exposure should be lengthened sufficiently to make up for the time the lens is covered. Some streets have little traffic at night, while in others the amount varies greatly at different hours. In the theatrical district, for instance, one would avoid the congestion of vehicles seen at the opening and closing hours, working instead during the lull between.



"THE CITY OF TOWERS." WILLIAM S. DAVIS

This study of a group of Manhattan "skyscrapers" was secured from a passing steamer on the East River on an overcast day at 1.10 P. M., with an exposure of 1-100th second, stop $f6.3$, on instantaneous Iso plate.

Lighted entrances of buildings make interesting subjects, if the architectural setting is good, and less exposure is commonly required than for an extended street vista.

In any city possessing a waterfront, the first thing to consider is the different viewpoints which may be available. Many good bits can be found around the piers and ferry landings, while the end of a pier often provides an excellent point from which to watch passing vessels. Good compositions of shipping and the city sky-line can sometimes be seen from a bridge, but to secure these subjects from the greatest variety of positions, one needs to be afloat, so the routes of the different ferry and local steamer lines should be studied. On the water beautiful atmospheric and lighting effects are most frequently seen in the early morning and late afternoon on sunny days, some especially striking effects being visible when looking against the light. Considerably shorter exposures, or a smaller stop, should be employed on the water than upon land, as there are no heavy foreground shadows to consider as a rule. This, and the amount of light reflected from the water, makes the correct exposure average one-fourth what would be right for an ordinary landscape. To prevent possible blurring from motion of the subject or camera, use the 1-50th or 1-100th second speed of shutter, and regulate the size of lens stop to suit the light. As a protection against lens-fog, it is advisable to employ a hood or shade.

The field is so large and varied I have failed to touch upon many of its branches, but if these notes serve to stimulate some readers to investigate the possibilities of their home city they will serve their purpose, so I will close by giving the technical data concerning the production of the illustrations accompanying. Except where noted, an anastigmat lens was used, and in all cases the hours named are according to Standard time—not "daylight saving."



"AN OUTPOST OF EMPIRE"

F. J. MORTIMER, F.R.P.S.

From the Exhibit at The Camera Club, New York

BROMIDE PRINTING

THE following remarks on bromide work are intended for workers with this medium who have some acquaintance with its manipulation, but who are anxious to avail themselves of the special features of this flexible printing method and so be able to control the operation to their particular liking.

In the first place, let us consider what the medium itself has to present as a factor in control.

By selection of the kind of paper, the photographer discovers, at the outset, that far more general control over the ultimate results is possible than he supposed.

He has at command very slow papers, which demand minutes for proper exposure, and again, rapid brands, which need but seconds to effect satisfactory results. Wherein is the advantage in this latitude?

The slower the paper the greater the tendency to contrast in the print, other things being relative.

This enables one to produce a bright print from a flat negative, by use of a slow variety of bromide paper, and vice versa a modulated print from a negative of strong contrasts, by use of a rapid emulsion paper. Then again, another source of control—the surface of the paper. The smooth surface papers, by keeping the image from sinking in, exhibit more detail in the high tones but in the deep shadows there is a tendency, if not more than a tendency, to heaviness and dullness.

Coarser surface papers enable us to get more transparency in shadows by suppression of minutiae.

Matt and platino matt surfaces present a general softness, but sometimes the shadows show dull and lustreless.

The so-called carbon surface, on the contrary, gives shadow transparency, without too great intensity in high-lights.

Cream tints are effective in portraiture or where a general warmth of tone is desirable—a sunny landscape, for instance.

It goes without disputation that the character and intensity of the illumination is a potent factor in control.

You have been told, time out of mind, that equivalent exposures vary with the square of the distance from the source of illumination. This is true enough in a general way, but if a comparison of respective exposures be made for widely varying distances, there will be discovered some important, though not pronounced, differences which may, at times, be turned to good service.

Suppose the photographer is using a negative of average density and he finds that an exposure of three seconds at a distance of twelve inches from light source gives fairly good results. According to the rule of variation in light intensity, if he should remove the frame off to fifteen feet, the exposure required would be about twelve minutes.

Now let us develop in the same way these two exposures, supposed to be

equivalent, and we find that the one, which was exposed at one foot from the light, does not show the same contrast as the one printed fifteen feet off.

This phenomenon reveals the fact that there is, at least, a slight means of control in modifying contrasts in the negative. The slower the paper used and the more contrasty the negative, the more pronounced the difference between near and far printing with equivalent exposure.

Now we have some data furnished for fixing the distance in printing. This is a matter, as you may divine, of some importance.

First of all, diagnose the negative by looking through it at an angle against a piece of white paper and estimate which part is the densest, which ought to show detail in the print.

Have the white card illuminated by a strong light, place a card over the negative with a part cut out large enough to include this dense part, referred to above, and examine the density against the brightest part of the illuminated card. Move the negative with the card, to or from the bright card, until the detail becomes visible to your eye. This distance will fix the distance for printing.

Now as regards exposure. Correct exposure is the *sinequanon*, but it can only be had by experiment.

Suppose the negative under trial gives a fairly good print with the paper in use at a certain distance and for so and so many seconds. Now, cover over a portion of the negative and give a couple additional seconds. Then cover over these two parts and increase the time by a second. In this way you will have sectional parts with varying time.

On development it will be noticed that the differences are slight, but it is also found that the strip which has received, say ten seconds, shows enough difference from that having nine seconds as to warrant the exposure with the ten seconds.

Dilution of developer slows action, thereby affording better opportunity of judgment of progress.

If exposure is correct, by the time detail in the highest light shows up, the shadows will have been properly developed and development may be stopped.

But this does not invariably happen, because usually the contrasts of the negative are a little too strong, or too weak.

If too weak, the remedy is to aid contrast by using a weaker light in exposure, or by increasing the distance between the light and the negative.

Sometimes a pale yellow glass is superimposed on the printing frame where the contrasts are too pronounced and we do not want to change either our printing light or its distance. It is best to give exposure long enough to bring out developable detail in the highest lights.

Normal developer with a strong contrast gives over-developed shadows by the time the detail in the highest lights are out.

The remedy is to dilute the developer with proportional quantity of water which slows action and reduces contrast.

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The Mortimer Exhibition

FLOYD VAIL, F.R.P.S.

For many years one of the most eminent contributors to the advancement of pictorial photography, as editor, author and exemplar, has been Mr. F. J. Mortimer, F.R.P.S., of London, England. Filling the position of editor of *The Amateur Photographer and Photographic News*, and lately as art editor of the consolidated periodical, also as editor of *Photograms of the Year*, recognized as the annual of pictorial photography *par excellence*, his assistance and influence have been very great. But his productions as an artist, particularly in his specialty of marine work, have done even more to win recognition and respect for photography as a medium of artistic expression. In this field he has never been surpassed.

With thirty years of knowledge acquired and experience gained and applied, it is not surprising that it has been demonstrated in America recently that his work is outstanding in merit and art. On invitation of The Camera Club, New York, he sent an exhibit of sixty examples, which has been shown in the spacious galleries of that organization since June 1, 1921, and which will be displayed until August 31, 1921.

Almost every mood, effect, expression or feature of the ocean can be seen among his collection, from wildest storms to the calmest view, and from the broadest expanse to the most confined, many unique, all masterly in art and technique. And other pictures included—genre, landscapes, decorations, war scenes and type renderings—are not less meritorious. It would require much space to do even partial justice to his show,

and it is doubtful if any description would be satisfactory or complete. Just a reference to a few of his pictures will have to suffice to convey an idea of his unusual skill and results.

"On the Rocks" features a noble, full-rigged ship fast on the rocks. Its former title, "The Elements at War," suggest perfectly the high seas and portentous sky that foretell the doom that awaits. Nothing more pathetic or thrilling could be produced by photography or a deeper emotion awakened by any medium.

"The Black Squall," "The Storm" and "Strife," all printed on extra-rough paper, are somewhat similar to each other, but all vary sufficiently in surf, clouds, expression, values and lines to give an entirely different rendering of ocean's ever-changing forms and effects.

"The Coast of Scilly" shows towering rocks, with surf-tossed spray and seething foam covering the shore, so realistic that one can almost imagine the thud and the roar, sniff the salt dampness and feel the chill.

"In Fine Frenzy" fills the beach and sky with thickest spray, leaving nothing to be seen but Nature lashing foam-covered boulders in frenzied fury.

"A Storm Brewing" is most delightful in its grandeur, disclosing huge, wind-driven breakers and in-coming gulls, one of which, resting on a protruding ledge, is seen calmly awaiting the arrival of its fellows.

"In the Height of the Storm" is a large picture, with a graduated sky and tossing, scurrying breakers disintegrating on the shore, which looks like a boiling cauldron. The whole scene is rendered in masses of exquisite values that make a high-keyed, toneful print that is most delightful.

"The Top of the Tide" and "Britannia's Realm" are charming companion pieces, dark, weird, frowning, with textures and lines that are very beautiful.

"Mid-Ocean" is much like "The Empire's Cradle," each featuring a full-rigged vessel under full sails, with swelling seas and fascinating skies.

"The Foot of the Cliff" depicts surging surf along a rugged shore, contrasted by dark rocks and lowering sky, all forming a delightful pattern of light and shade most beautifully blended.

"Types" are unique and pictorially presented and show war-time sights of "The Wounded Tommy," "The 'Bus Conductor-ette," "A Hospital Sister," "The Special

Constable," "From the Trenches" and others. These are all greatly admired.

"The Trail of the Huns," "Lest We Forget," "The Minesweeper and the Destroyer," "All's Well," "The Gate of Goodbye," "The End of the Trail," "The Majestic Main," "In the Thick of It," "Crack o' Doom," "The Punch and Judy Show" and all the others must be seen and studied to be appreciated sufficiently, as no description can give an adequate idea of their superior excellence.

If more photographers would strive after the hidden meaning, and try to give the spirit of the scene they seek to interpret, after the manner of Mr. Mortimer, they would sooner arrive at the stage when they might truthfully be styled photo-pictorialists.

Judgment in Natural Color Photography.

There are several indirect schemes for reproduction of nature's color by photography, but no successful direct method of interpretation.

The opinion of artists varies as to the validity of the performance of translation, but to the photographer, who is accustomed to judge reproduction from the actual in terms of monochrome, the appraisalment of color photography becomes particularly difficult, inasmuch as it is hard to divorce his judgment from the influence exercised by the method he is accustomed to estimate tonal values in the ordinary photograph. All of us, mentally, translate color masses in terms of black and white.

That is, an ordinary good photograph, with well preserved tonal values, suggests a good deal of what the eye sees in the colored objects themselves, so that when we come to view the natural color picture, the represented masses of color seem in a measure crude when seen placed in juxtaposition.

The minute and delicate gradations of the originals have to take their chances at the meeting edges of the associated areas, and are likely to be unpleasantly modified by complimentary color effect, producing a garish appearance and so making, by false relation, unnatural relative tone.

Of course, the painter in his scale reducing of the scene, encounters the same difficulty, but he gets over the bad effect by modification of tones, by suppression or even complete extinction of intensities artistically incorrect and withal unpleasant.

We might here inquire, before going further, is this undesired effect due to the method itself or to our psychological perception? We venture to say—that the sen-

sation is purely psychological, because the translation of the colors in juxtaposition in the monochrome picture shows no indication of impression from the complimentary action—while in the natural color photograph the juxtaposed areas of color affect the vision much in the way of the original.

We have often noticed the effect in a hand-colored lantern slide when projected on a screen, even when the coloration is skillfully done—that is, the actual colors imitated, and no modification attempted by the colorist.

This phenomenon does not present, when an autochrome or other color process slide from an oil painting or water color is shown, because the scheme of color value has been arranged by the painter and the modification effected in the photograph. Hence we are warranted in saying that the defect is not to be attributed to the natural color process—but because of the reduction in size of the areas of color incident upon the mechanical means by which they are thus brought in contact to concentrate the undesired effect.

Where the vision takes in nature's large masses over an extended space, the effect is like what the painter's presentation produces.

The colors seem more vivid and intense than in the open air, which is also due to the proximity of the masses. Perhaps—in the strong illumination there is extra radiation from things colored, which is relentlessly registered on the sensitive film—not subdued as with vision.

Whether we are right in our views or not, the principal artistic fault in natural color photographs lies in their lack of breadth and repose.

Dark and Light Grounds

In connection with the rule, that for dark heads a light background and for fair heads the reverse is necessary, the fact should not be lost sight of that where darker grounds are used they must always be selected so as to be several shades lighter than the shadow side. But even this is not the only requisite. We must have perspective, not mere relief (above all avoid stereoscopic relief). We know this is accounted heresy by some of the votaries of the advanced school, but in proof thereof take any of our old masters and we shall see it exemplified. Yet, we know how they are now ridiculed in so-called modern art teachings. Novelty seems to be of more worth than established elementary truths.

Prevention of Halation

Recent correspondence shows that the causes of halation are not yet thoroughly understood. Each writer has his own pet theory as to what gives rise to this trouble, and how to avoid it, yet expresses surprise that apparently opposite methods and conditions do not exhibit the annoying feature.

The truth is that there are many causes, and halation will not be obtained unless (as a rule) more than one of these is present. May it be said without giving offense that the apparently miraculous instances given of supposed halation-inviting subjects do not at all impress me, not because I have any claim to absolute immunity from halation in my own work, but because I have been able to make some amount of practical investigation of similar subjects, and have thereby been able to avoid the trouble completely in cases where the "invitation" has been considerably more pressing. It must, I think, be conceded that there are still cases in which halation cannot be entirely avoided, but even these rare cases can be handled so that its presence may be unnoticeable by any but the hypercritical.

To begin with, it is necessary to make some definition, such as to state that by halation I mean any spreading of light around any portion of the image, and irrespective of scientific subdivisions, and by correct exposure I mean such exposure as will render a satisfactory amount of shadow detail by ordinary methods of development followed by printing on my favorite printing medium. That is to say, I propose dealing with the subject from the practical photographer's point of view with a reasonable amount of latitude of terms, so that I hope no one will want to quibble with me on points of definition, so long as the conclusions of my arguments are agreed to. For instance, when I state that I find halation difficult to obtain, I know perfectly well that it is quite easy to obtain by placing a plate in contact with a sheet of black paper in which there are some pinholes and exposing the same to a source of light for sufficiently long. The image of each pinhole will be surrounded by halation more or less defined according to the degree of diffusion of the light and the nature of the emulsion. What I mean by difficulty of obtaining halation is the difficulty of getting it in the camera, on subjects of quite "inviting" a character, when using my favorite plates and lenses, whatever developer I may use, or whatever its degree of dilution.

In that last sentence all the factors have been stated: The subject, the plate, the developer, and what is so seldom suspected, the lens. In my opinion, when a bad case of halation occurs it is never due to one of these factors alone, and generally can be traced to more than two of them being present, so that by noting the conditions of each of those factors it becomes possible in many cases to avoid the combination of circumstances which are likely to accentuate the trouble.

Of course, it is the subject that usually is considered to be the principal source of halation, but beyond the very elementary proposition that without a subject one would be entirely free from the fault I am compelled to say that in a very great number of subjects which would seem to be pre-disposed to halation there is not the slightest sign of it, and where a worker finds the undesirable feature occurring frequently in such subjects he will usually find it also, though less pronounced, of course, in his general output. The kind of subject that is supposed to be "difficult" from the halation standpoint is naturally one with abruptly marked contrasts, such as an interior which includes windows in the view photographed, a male sitter in evening dress, and especially subjects which contain artificial lights, whether diffused or unscreened. When surprise has been expressed at the absence of halation, or when merit is claimed for any special material or method, it is always in connection with such subjects, but I wish to point out that although these do often exhibit the trouble in question, it is comparatively few cases in which it is not preventible. It is obvious that a variety of subjects prone to halation contains detail in the high-lights comparatively over-exposed when compared with the detail in the shadows. That is to say, that if one were photographing those high-lights alone a fraction of the exposure given to ensure satisfactory rendering of the shadows would be sufficient. For instance, a large machine may contain black castings in shaded parts, while in a prominent position as regards light may be a dial consisting of white card bearing fine black lines (a volt-meter or pressure gauge). If one were photographing the dial alone a quarter of normal (*i. e.*, meter reading) exposure would suffice, yet it is likely that six times the normal will not be overmuch for the black details. Therefore, the dial will have received quite twenty-four times the exposure that one would give it alone, and if any halation were

present it would certainly obscure the fine black figures on the dial. Such a case as this is quite usual in the experience of every commercial photographer, who obviously cannot follow the advice of a correspondent who recommended that one should not expose so that any detail should penetrate the emulsion. He would be a fortunate man who could limit himself to subjects that did not compel him to do otherwise. It is not suggested that in a case such as the one described the dial will be rendered as clear and brilliant as though it had been taken by itself, but the writer has in his possession quite a number of such photographs in which the machinery is quite fully exposed and in which the dials can be read (with a magnifying glass in some cases) although the black lines in the photographs must be less than a five-hundredth of an inch in thickness. This description of subject is actually a greater test than the instances so often quoted of detail photographed against the light of factory windows. If these supposed remarkable instances are analyzed it will be found in a great many cases that the difference between the exposure required for the subject itself is not greatly in excess of that needed for the view through the window if the latter were photographed with a dirty piece of glass in front of the lens as in the actual case in point. If, however, the subject be photographed against a window which is itself the only or, at any rate, the main source of illumination, the case is very different, as the light which reaches the side of the subject facing the camera obviously is far weaker than the direct light shining in the lens, and the disproportion between the exposures that would be sufficient for the subject or for the window or view outside it are infinitely greater than in the examples suggested above. The disproportion is even greater than in subjects in which the source of illumination (whether day or artificial light) is included, but arranged in a more normal way. What I am aiming at explaining is that the only sort of subject in which halation may be said to be inevitable or excusable is that in which not only is there a source of illumination, but in which also that detail is over-exposed by some hundreds of times. Even then it will be found that if the other factors are favorable the halation can often be confined mostly within the illuminated area itself, and it will not be noticeable except in the rebate of the negative. The writer

was asked recently to photograph a subject which might seem the very limit as regards halation-inviting. A network of wires, the latter less than a sixteenth of an inch thick, was suspended seventy-five feet above the ground, and further wires connected this arrangement to the earth. The whole was about a hundred and fifty feet in length, so that on reducing the subject to whole-plate the thickness of the wires could be seen on the ground-glass only as a very faint grey hair-line when examined with a powerful focusing-magnifier. The difficulty of the case was not diminished by the fact that the supports had to be rendered upright, so that a somewhat distant standpoint had to be taken, and the axis of the lens was necessarily neither central nor square with the plate. In addition to this, the wires were moving slightly in the wind. Yet it was found possible to obtain a perfectly sharp map-like photograph of the wires, and in a couple of plates the surrounding landscape, both foreground and distance, was quite satisfactorily rendered also.

Being of an experimental turn of mind, and wishing to test my theories as well as those raised by various correspondents, I arranged a test subject intended to include all the problems likely to give rise to halation. A half-watt lamp of three hundred candle-power was hung so that the etched lettering on it faced the camera. A large focusing-screen was supported in front of this, so that one of the sides of the wooden frame cut the image of the bulb but left the other half clear. On the ground-glass (which was only a few inches from the lamp) two negatives were fixed with lantern-slide strips, one a line and one a tone subject, still leaving part of the ground-glass clear, and some scratches were made in both negatives. Still further complications were introduced by shading half of this arrangement with a thickness of tracing cloth, and by sticking overlapping strips of translucent paper on the edge of the wooden frame. Close to the unobscured half of the lamp was arranged a group of objects that normally would be considered not an easy subject, taken as a whole, to photograph, ranging from a piece of cotton wool and a graduate half full of water to a bottle of Azol. A sheet of ground-glass, to reduce the intensity of the light, separated this group from a similar set, which, however, contained even darker objects. To add to the "difficulty," I pinned on the wall at the back a sheet of printed

matter, this extending from the least illuminated portion to immediately behind the bulb itself. Thus the subject could be considered to consist of a very powerful direct light, as well as brilliantly illuminated "windows" of many shapes, sizes and densities, many of them overlapping one another, as well as details of such nature and in such positions that if serious halation occurred they would be lost.

The plates were of two makes and of three varieties. It was found that with the stop which was used throughout an exposure of three seconds on a backed ultra-rapid plate gave not only a perfect rendering of the bulb, with all the details immediately adjacent to it, but also everything else except the very faintest shadow gradations. Printed with care on a contrasty paper, this gave a very fair reproduction of the whole, and a quite perfect result of the lighter portions. There was no halation, except faintly round the filament itself, though there was a little diffraction in the form of a few tiny lines radiating from it across the wooden bar previously referred to.

All the plates used were about the same speed, and the exposures given ranged from the three-second one to three times as much, then forty times, and finally two-hundred and fifty times the original exposure. Of the latter four plates were exposed and developed in different ways and with different developers. Regarding the amount of halation, it may be said at once that in proportion to the detail image—that is to say, as seen in the prints—there is very little difference between any of these greatly varying exposures. What little there is, is only to be seen immediately around the lamp; and in all the negatives, and most of the prints as well, every detail of the lettering on the bulb is plainly readable, and very little of this is lost on any of the prints. The filament itself is, of course, reversed on all excepting the first three-second plate.

The modes of development were as varied as the exposures. For instance, two similar plates, both unbacked, were exposed for two minutes each, and developed in M.Q., but in one case the developer was used in concentrated form, and for the other was diluted so that the plate took ten minutes to develop to equal density. No difference could be detected. As a matter of fact an enlargement was made from the slowly-developed one to the size of the original subject, and in this the gradation through-

out is distinct, from the detail in the bulb itself to the darkest shadows. The line subject can be plainly read, even in the part of it that is seen through the glass of the electric lamp, and the writer was complimented on the quality of the texture of the details by one whose familiarity with photographs must be such as normally not to arouse any enthusiasm. In this case the bulb was over-exposed by forty times, and the other parts of the subject by six or eight times, and the plate was unbacked and softly developed. Of the plates which were exposed for over six times as much again as this one, one of them was unbacked and was of slightly greater speed. This "impossibly" over-exposed plate was developed in Azol of such dilution that at the end of an hour it had not attained printing density, so was finished off with a little stronger. There is actually no more halation in this than in any of the more normally treated plates and none in the "windows," and although the "quality" of the gradation naturally is poor no detail is lost anywhere. Of the backed plates similarly over-exposed, and developed normally for four minutes, prints show the best quality and gradation of any, though they are, of course, so dense as to make enlarging from them an utter impossibility.

I do not propose to argue from this that any exposure and any method of development will not bring out halation, but it does prove that if one uses plates that are reliable, it seems to matter little how one treats them. I would suggest to anyone who is frequently troubled with halation to ask himself if he ever congratulates himself on the rapidity with which his plates fix out. I think it will be found that a plate which is liberally coated with emulsion, and which therefore fixes slowly, will be found far less prone to halation in any circumstances.

It is a fact that in the case of plates which do give halation rapid development with a normal developer, or one slightly stronger and *not cold*, will reduce this liability. In proof of this a client who had been trying his hand at outdoor night-scenes complained to me of the intense halation round every street lamp. I asked him how he developed? The answer, "Tank." On my recommendation he tried rapid development, and had entire success with the same make of plate. There is no difficulty about this if one employs the time-and-temperature method. Having developed a trial plate of a trying subject, at, say, 70

degrees by judgment, but noting the time, it is easy for any experienced photographer to decide whether for the future he will develop such subjects for a longer or shorter time.

Now I come to the last of my list of halation-giving factors, namely, the lens. And in writing this I can visualize the smile of derision on the faces of some of my readers. Yet I am of the opinion that, next to the plate, the lens is more often the cause of provoking halation than any of the other factors. This opinion is the result of experience in many carefully noted cases. While not pretending to any theoretical knowledge of optics, I think that the way in which a lens produces halation of a brightly-illuminated area is by the images of such details being reflected from one surface of the lens to another, and such reflected images being still powerful enough to be projected by the lens along with the normal image, but not quite coinciding with it and, of course, very much out of focus. Besides this there is a certain amount of flare, or diffused light, produced by every lens when a brilliant subject is being photographed. It is well known that single lenses are the least liable of all to this sort of trouble, but the occasions on which they can be used are so rare, on account of defects in other respects, that they are ruled out by the practical photographer. Of lenses in general use I have found anastigmats made to work at a maximum aperture of $f8$ most satisfactory as regards freedom from halation in results. It is not at all difficult to make comparative test of lenses as to their qualities in this respect without actually exposing any plates. The way to do this is to arrange a movable light of fairly large area, such as a lamp of any sort with a sheet of tissue paper or ground-glass in front of it. Then, having focused the camera on a subject containing some darkish details, not too brightly illuminated by some other light source, examine the image with a focusing magnifier, and, while doing so, get an assistant to bring the bright, movable light so that it comes into the field of view and away again, and note whether the brilliance of the detail examined is affected or not. If it is seriously affected, it is obvious that such a lens calls for the use of a hood when used on any subject in which any bright area is likely to shine in the lens, and should be avoided altogether for such as actually include brilliant portions. Even without going to such trouble as this it is surprising

how the probability of halation is revealed by the use of the magnifier. For a considerable time I was worried with a distinct thickening of fine, white lines in a certain description of dark subjects. This was when employing either of two lenses I had then in use, and was shown both in making original or reproduced negatives of the kind of subject referred to, though both appeared to give good definition otherwise, and I then attributed the fault to halation in the plates, but on trying a new anastigmat on the same plates was agreeably astonished to find the trouble vanish.

Another instance which will illustrate my point is when using a lens for enlarging, more especially in apparatus in which a condenser is used. When a dense negative is being enlarged from which a clear area is included, or when the clear rebate is projected, the developed image often will be marred by any such black portions being diffused on to the surrounding surface. This has been attributed by some to dust in the air, to "spread" in the emulsion, to anything but the actual reason. Yet if a really high-class lens be installed, and, still better, if the condensing lens, with its deep curves and optical faults, be done away with in favor of a reflector arrangement, the trouble referred to will vanish.

To sum up, I think it may fairly be stated that provided one employs plates of a kind that is thickly coated with emulsion, and is backed with a really efficient backing, and one uses lenses (well hooded when possible) that show on actual trial to be free from flare, one may tackle the most extreme cases of "halation-invitation" with a care-free mind, and without taking any special measures as regards development. It may be added, however, that cases of apparent halation have been traced, in my own experience, to poor black on the inside of camera bellows, to dust or condensation on the lens, and in one case at least to faulty balsam in one combination of the lens. This defect was visible only on holding the lens up to a small source of light and looking through it in a slanting direction. It was then seen as a faint veil, but it had a very noticeable effect on the images of any bright points in the picture. Lenses should not be judged, in respect of the trouble mentioned, by their price or by the maker's name, nor by any theory as to any particular type of lens. The only way is by actual practical test of the individual lens.—*D. Charles in the British Journal of Photography.*

Notes From Foreign Sources

Ferric alum as a Reducer. *Il Progresso Fotografico* gives the following formula:

Water 100 c.c.
Crystallized ferric alum ... 2 grs.
Strong sulphuric acid 0.5 c.c.

It is claimed that this solution produces a marked effect in a few minutes. The plate is then rinsed, immersed for a few moments in a 5 per cent. solution of sulphuric acid and washed. The reducing mixture has good keeping qualities.

Further Applications of Paper for Negatives. According to *La Revue Française*, German firms are now offering paper negatives in the fashion of the well-known roll-films of celluloid. The paper backing is colored to prevent halation. The latter feature has been made the basis of an application for a patent.

Actinol. A desensitizer has appeared in the French market under this title. It is presumably a solution of safranin, as the directions for its use are exactly those recommended for that substance. It is stated, however, that it is partly due to the results of researches recently made in the Lumière laboratory, an account of which was given in the July number of the PHOTOGRAPHIC JOURNAL OF AMERICA.

The British Journal of Photography calls attention to the danger of using glycerin for preventing curling in the development of bromide paper, as it tends to keep the paper moist and causes early fading of prints. Instances are given in which papers so treated faded seriously in a few years, while prints nearly forty years old which had not been treated are still in excellent condition. It is important to keep all such prints in a dry atmosphere. The matter is of especial importance, nowadays, in view of the extensive use of the bromide print for duplicating manuscripts and legal documents. It is likely that even slight amounts of moisture are injurious to all photographic products.

Blue-prints carefully made, kept dry and in the dark are long-lasting. One of the great railroad companies of the eastern United States has in its vaults blue-prints a half-century old, that are still in excellent condition. In all procedures for copying documents or plans, when durability is important, the quality of the paper must not be overlooked. A great deal of very poor paper is now on the market. Ground wood is extensively used, being made into sheets

with a small addition of true pulp, just enough to hold it together until it can be marketed. Paper of this kind falls to pieces in a few years.

The British Journal of Photography states that in England it has been formally agreed that trained physicians who do X-ray work shall be called "Radiologists," and non-medical X-ray workers "Radiographers." This leads to a suggestion that those who merely work at photography for research purposes shall be termed "Photologists," while commercial photographers shall retain the usual title. Where shall the "push the button and let others do the rest" come in?

Japan Adopts the Metric System. The *Chemical News* states that the Japanese Government has now made the use of the metric system official. The advisability of this step was perceived several years ago, but the war prevented definite action. The provisions of the edict are that within five years all public works, government offices, schools and large factories will be obliged to use the system exclusively, but the people at large will be given twenty years in which to become accustomed to it.

Catalysis in the Hydrolysis of Esters by Infra-red Radiation.

ERIC K. RIDEAL and James A. Hawkins (*Jour. the Chem. Soc.*, 1920, cxvii, 1288—1296) find that the hydrolysis of methyl acetate by dilute hydrochloric acid is catalytically accelerated by infra-red radiation. The temperature of the mixture of ester and dilute acid was kept constant by means of a thermostat. In the experiment proper the mixture was subjected to infra-red radiation usually obtained from sunlight or from a glowing Nernst filament by means of an optical system of lenses and a quartz prism. In the control experiment the mixture was not illuminated. In a series of such experiments the illuminated ester was hydrolyzed far more rapidly than the ester which was kept at the same temperature in the dark.

Improvements in Enlarging Apparatus. The *British Journal of Photography* discusses editorially, in a recent issue, the trend of improvement in apparatus for enlarging, pointing out that such methods of making positives are rapidly displacing the contact methods. One objection to the standard apparatus has been the space occupied and the delay in fastening the print and focusing. A radical change has been made in the newest apparatus by making it vertical, which

takes up much less space and facilitates the placing of the sensitive paper and the negative. More elaborate apparatus is now available by which a correct focus is obtained automatically, whatever the size of the picture. Some changes have also been introduced in the illumination of the negative, a diffuse light obtained by reflecting a gas or electric light from an opal surface or through an opal screen being used.

A Possible Addition to Reducing Agents. Sodium perborate is now a commercial article, and the *Chemical News* records an improved process for its manufacture. It is an oxidizing agent like persulphate, and it will be worth while for some investigator to try it as a substitute for the common reducers.

Anomalies in Toning

It is a mistake, to confound the strength of a toning bath with the quantity of gold contained therein.

For instance, two grains of gold chloride, dissolved in sixteen ounces of water, will tone a certain number of prints, but if this quantity is put in 100 ounces of water, it will not tone the same number as it did, with only a pint of water.

The formula may call for "sufficient water" and instruct to "add gold sufficient for the number of prints to be toned." It does not take into account the proportion of water to the quantity of gold, which a practical worker might regard as sufficient.

Sometimes a toning bath behaves as if it were spent, that is, it refuses to tone any longer, or is so tardy in action so that the tone is spoiled, but on testing it for the content of gold, we are surprised to find that only one-half the original amount has been used up. There is risk of regarding such a bath as worked out and danger of putting it to the sink as worthless.

A weak toning bath keeps up the action instigated by a strong one. It therefore follows, that if a large number of prints is put in a fresh bath, or full strength bath, more will be toned effectually than if half the batch had been put in first and the rest, after these first are finished.

Temperature and gold is worth consideration in toning.

A rather weak bath, at ninety degrees, works as well as a strong bath at ordinary temperature, say 70 degrees.

The greatest economy in gold results, without detriment to the prints, by using a toning bath over and over; with the addi-

tion of gold, in proportion to the number of prints to be toned.

The chief thing to remember is, that the strength of the toning bath, the proportion of gold to solution, controls the process of toning, not the absolute quantity of gold present in it, and that this content of gold can be made to do the work, best, by repeated use of the one bath and by consideration of the temperature on the toning of a considerable number of prints at the same time, when the solution is still at full strength.

Pictures Taken Through Stone

A recent dispatch to the *Philadelphia Public Ledger* from Paris states that the French scientist Contremoulins, chief of the laboratory of radiography for the hospitals of Paris, has just demonstrated in a series of remarkable experiments that an X-ray apparatus can photograph objects through a stone wall more than 250 feet distant from the source of the rays.

Contremoulins does not lay claim to full development of this work, declaring the practical biological value requires ten to fifteen years to perfect, but he has actually made plates at various distances with rays projected through all kinds of building material. He is preparing documents now to submit to the French Academy of Sciences.

Starting with an ordinary apparatus a little more than four yards distant from the sensitized plate, he, in the lapse of one hour, obtained a clear photograph of metallic objects for which the rays filtered through a marble plate more than an inch thick, a sheet of lead an eighth of an inch thick, twelve inches of oak and four inches of plaster.

At fifty feet from the same source, then at 130 feet and later at 260 feet, during four hours' exposure, human bones and other objects, including a crab with one claw, were clearly photographed when placed on the inside of the brick and stone wall of one hospital building. It is recalled that in 1896 the first radiograph apparatus required eight hours' exposure with the plate only ten inches distant.

This brings into discussion the possibility of photographing people through the walls of their own houses, as everything in the conical path of the rays is affected until the rays find the plate, which absorbs them. It is not known just how distinguished academicians will accept this photographic intrusion into the privacy of the home.

Recent Patents

1,373,626. *Vignetting Attachment for Multiple-Exposure Cameras.* In an attachment of the class described, telescopic tubular members, means for attaching one of said members to a camera front, and a plurality of spaced light ray interrupting means within one of said members.

1,377,887. *Apparatus for the Developing, etc., of Films.* In an apparatus for treating films, a film-immersing tank, film-actuating means, and means to move the one relatively to the plane of the other; said first-mentioned means being disposed substantially horizontal, to move the film in approximately a horizontal plane in said tank.

1,377,564. *Photographic Exposure-Meter.* In a photographic exposure-meter, including sensitive paper, a member for protecting said paper against the action of light and having a transparent portion, and a mechanism adapted to effect a relative displacement between said paper and said protecting member, and to positively limit such displacement to a definitely limited angle.

1,374,678. *Photographic Camera.* In a camera, the combination with a casing having a rear opening and a door pivoted to the casing and normally closing said opening, of a ground-glass disposed within the casing and normally presenting a smooth forward surface substantially in the focal plane of the camera, links connecting the upper end of said ground-glass with the casing: means connecting the lower end of the ground-glass plate to the door movable in unison with the links for maintaining the glass parallel to its original position, and stop means associated with the door for limiting the opening movement thereof; said connecting means, links and stop means relatively so disposed that the opening of the door to its said limiting position will move the ground-glass to present the roughened surface thereof substantially in the focal plane of the camera.

1,377,455. *Autographic Camera.* A camera adapted to produce a principal image upon a sensitized member therein, a passage having light-tight walls and opening at one end adjacent to the front of the sensitized member in the camera, the other end being adapted for the reception of light to be conducted to said member, the said walls having a hinged joint between their ends whereby one section of the light-tight walls is hinged with relation to the other section

of said walls, means for guarding the said joint to exclude light, means for producing in the passage a supplemental image on such sensitized member, an exposure-timing shutter to independently control the light passing through said supplemental image-producing means alone, and an inscription carrier so supported that the image of the inscription thereon will be projected on the sensitized member in the camera by said supplemental image-producing means.

1,374,794. *Camera.* In a device of the class described, a focusing glass, means for mounting the latter to swing on a horizontal axis, a mirror mounted to swing rearwardly from the lower portion of said glass, and a film holder mounted in the rear of the mirror and adapted to swing on said horizontal axis.

1,377,366. *Between the Lens Photographic Shutter.* In a camera shutter, the combination of a support having a focal opening, shutter leaves pivotally mounted on said support to either side of said opening and alternately coöperable to open and close the focal opening, master rings operatively connected with said shutter leaves, levers connected to said master rings respectively, and cam actuated means for operating said levers, substantially as set forth.

1,377,322. *Motion-Picture Camera.* In a motion-picture camera, the combination of a lens, a rotatable shutter having a plurality of openings at different distances from its axis, some of said openings being adapted for projection purposes and the balance being adapted for film-exposing purposes, means for varying the distance between the axes of said lens and shutter, and means for rotating said shutter when said axes are at either of two different distances.

1,377,265. *Motion-Picture Camera.* In a motion-picture camera, the combination of a film guide, a perforated strip of film therein, a crank, a finger mounted on said crank, an arm extending from said finger, and a guide having a guiding surface engaging the end of said arms, said arm constituting a lever whose lever arm is of constant length.

In a motion-picture camera, the combination of a film guide, a perforated strip of film therein, a crank, a finger mounted on said crank, an arm extending from said finger, and a guide having a guiding surface engaged by the end of said arm, said guiding surface being rectilinear, said arm con-

stituting a lever whose lever arm is of constant length.

In a motion-picture camera, the combination of a film guide having a rectilinear guiding surface perpendicular to one plane and at right angles to another plane normal to said first plane, a perforated strip of film therein, a crank, a finger mounted on said crank, a second guide having its guiding surface parallel to one of said planes, and an arm extending from said finger and having its end engaging said guiding surface so that said arm constitutes a lever whose lever arm is of constant length.

1,377,528. *Automatic Camera Shutter Trip.* The combination with a camera having a casing having openings along the top and one of the side walls thereof, and a shutter-operating lever protruding from said casing, a spring actuated motor for operating said lever, and means to regulate the action of said motor, of a plate provided with rearwardly extending tongues adapted to engage in the respective camera openings, and means for detachably connecting said plate to said motor for retaining the latter in operative relations with said lever.

1,377,250. *Photographic Printing Apparatus.* In a photographic printing apparatus, the combination of a holder carrying a printing plate, two oppositely swinging holders arranged to interchangeably position members carried thereby opposite the printing plate, means for causing a relative movement of said holders toward and from each other to place the printing plate into and out of contact with the opposed member, and pressure means for causing an intimate contact of the printing plate and opposed member.

1,377,249. *Photographic Printing Apparatus.* In a photographic printing apparatus, the combination of supports for sensitized plate and for a printing plate, one of said supports being adjustable relatively to the other substantially parallel with the plane of the sensitized plate for placing the printing plate opposite different portions of the sensitized plate, and one of said supports being movable for placing said plates into and out of contact, means for causing an intimate contact of said plates, including a pressure member, means for adjusting said member substantially parallel with the plane of the sensitized plate and relatively to the printing plate for locating the

printing plate and pressure member with their centers in different relations to each other, and means for illuminating the printing plate.

Improvements in Motion Picture Projection Apparatus

The extensive applications of the motion picture were not foreseen when the method was first brought to such a degree of excellence as to warrant its introduction upon the amusement stage. A vast amount of ingenuity has been expended upon all parts of the procedure, but in some respects research has failed to accomplish desired results. One most important problem is still not satisfactorily solved, namely, the production of suitable slow-burning, or, better, non-inflammable film. The familiar "non-flame" film is somewhat combustible though not nearly so dangerous as the standard nitro-cellulose. Much attention has been paid to the shutter mechanism. It is an interesting fact, not known to the public at large, that the picture is at rest when visible on the screen, and that the motion of the film is made while the screen is dark, but the alternations of motion and rest, darkness and light, follow so quickly that the eye cannot appreciate them, and the scene appears continuous, except as to the illusion of motion.

If a film of low combustibility and high quality could be produced cheaply, the complications of the fireproof booth, registered operator and all the other troubles that attend the exhibition would be eliminated, and the application of the kinematograph to purposes of instruction would be extensive. It is true that the precautions now observed do not bear heavily upon the standard motion-picture theaters, for these are built essentially fireproof, and the entire installation can be made of the highest efficiency and safety, but the problem to be solved is the adaptation of the "movie" to the school room, home and scientific meeting, in which places the apparatus is to be used occasionally.

"The Problems of Kinematography" were discussed recently in a communication to the Royal Photographic Society of Great Britain by H. M. Lomas. It is published in the society's journal for June. At the same meeting, Mr. R. J. Trump described a new apparatus for projection, a "shutterless, continuous feed." This, termed the "Kingsley" projector, was stated to be the invention of Mr. Higginson, of Manchester. It depends

on the use of a series of mirrors. The apparatus dispenses with both the shutter and the interrupted feed, the film being run continuously. Detailed descriptions are given, but they cannot be understood without drawings. It is claimed that there is no dark period in the exhibition; therefore, less flicker. There is always on the screen an illuminated view, but it is not of the nature of the dissolving view so familiar in the ordinary stereopticon exhibitions.

The discussion which followed the reading of the paper and the exhibition of the machine in operation seems to show that those present were not entirely satisfied, but it must be borne in mind that the method is new, and, as in all other cases, experiments will remedy many defects. In the case of the machine exhibited, the mirrors were made with a particular form of steel, but it has been since found that this material has a low reflective power. The substitution of a higher reflective surface will give increased illumination.

Mr. Lomas' paper was a discussion of many problems still present to the motion-picture producer and exhibitor. He referred to the small size of the present-day picture, about 1 inch by $\frac{3}{4}$ inch, and stated that the old American Biograph film, one of the earliest of the commercial forms, used a picture 3 inches square, shown at the rate of forty per second. The static electrical effects produced on the celluloid film, which has to be moved and stopped sixteen times per second, are well-known troubles. Mr. Lomas also discussed the keeping qualities of films. He was unfortunate enough to lose some fine films that he had secured in the slum districts of Canton, the latent image fading out during transportation home, presumably while passing through the Red Sea. Dryness in packing is very important.

At a later meeting, A. Pereira presented a paper entitled, "From Camera to Cinema," being an account of the printing of a film. He described many of the mechanical appliances employed for the commercial production of films in a British establishment. Development with metol-hydroquinone is carried out at a temperature of 65 degrees F., and an acid alum fixer is used. For chemical toning, several different formulæ are employed, and the Ives method is favorably mentioned.

One of the most interesting views taken on a film is that of a mirage. A reproduction of this is given in the issue of the *Photographic Journal* from which these abstracts are taken. Some of the members

thought that the mirage had been made with a telephoto lens, but Mr. Pereira said that it was part of a film about 13,000 feet long, and, therefore, was taken in the usual way. It looked close because it was actually large.

It seems to be evident that one of the lines of improvement most to be encouraged in the motion picture is the production of a strong, highly transparent, slow-burning film, and then the general educational value of the method can be developed. Some phases of this educational value have been presented elsewhere in this journal.

Some Possible Applications of Microphotography

"Microphotography" and "photomicrography" are often used interchangeably, but they refer to distinct procedures, although the microscope is employed in both. Photomicrography is the production of magnified pictures of small objects; it is, in fact, a process of enlargement, differing only from the usual process of the studio by the fact that the original is a natural object quite minute, and not a negative of appreciable size. The procedure has been of immense advantage and extensive application in science, especially in geology and mineralogy. The special department of these sciences, termed *petrology*, has made, perhaps, the greatest use of photomicrography, and the invention of the color-plate has greatly extended the value of the method, since it is now possible to secure exact copies of the brilliant color effects that are produced when polarized light is used with mineral sections or crystals.

Microphotography is the production of minute pictures from comparatively large objects. It is most easily applicable to engravings and printed matter. With care the page of an ordinary newspaper can be reduced to a few square inches in area, and be legible. As yet, however, little practical use is made of the art. It is stated that during the siege of Paris, dispatches were sent out by carrier pigeons, in the form of minute sheets, which had been reduced by the method, and which could be easily read by projecting them on a screen with an ordinary lantern. Many will recall the microscopic views that were sold in Paris, and often attached to cane-heads. These consisted of a narrow glass cylinder, about half an inch long, convex on one end, flat on the other. On the latter was a photo-

graph about the size of a pin's head, which viewed through the glass was magnified sufficiently to be quite distinct. As might be expected, these Parisian productions were often somewhat free in subject.

About fifty years ago, the Brothers Langenheim in Philadelphia made a large number of microphotographs, specimens of which will be found in the older collections. Many objects were photographed, such as engravings of natural scenery, and city views, important and interesting documents, and portraits. The picture was usually about the area of pin's head, and, under moderate magnifying power, the details could be easily made out. One of the pictures was a copy of an engraved text of the Declaration of Independence, surrounded by the portraits of the Presidents and the seals of many of the states. A view of Paris, showing Notre Dame conspicuously, a view of New York from the roof of the Cooper Institute and of Eutaw Square in Baltimore were among the list.

These pictures were made by the wet process. A strongly acid iron developer was employed, and it is obvious that the focusing must be done with care. The arrangement is, of course, just the reverse of that used in photomicrography. In the latter procedure, the object is placed on the stage and the sensitive plate is the screen, but in microphotography the sensitive plate is on the stage of the instrument. As it is practically impossible to judge of the correct focus of so small an image, the focus must be set by placing on the stage an object about the size the final picture is to be, and then focusing sharply ground-glass of the camera. On reversing the arrangement, that is, placing the object at the point of the ground-glass and the sensitive plate on the stage of the microscope, the picture can be obtained.

It seems possible to make some useful applications of this procedure, which hitherto has been more used as an amusement than as a practical method. The copying of documents has become a very important work in photography, and in many cases it seems possible to reduce the picture materially below that of the original. Great space will be saved and much expense, if such document would be thus reproduced in, say, one-tenth or even one-twentieth the original size. Copies of deeds, mortgages, wills and transcripts of scientific essays so reduced would be easily legible with a hand glass. Our storehouses of such records are greatly overcrowded, and the question of

safe and convenient storage is becoming a serious problem with public offices and libraries. Not the least of difficulties is the preservation of the daily newspapers. These are now bulky, especially the Sunday editions, and of such poor paper that their preservation in a form, safe and convenient for consultation, is receiving earnest attention from librarians. Now, if a standard daily paper could be reproduced on good paper in an area of, say, 6 x 8, the storage of it would be a very simple matter, and, as noted above, any one with normal vision could read the page easily by the use of a hand glass of moderate power.

New Procedure for Obtaining Positives Directly in the Camera

Le Procédé, in giving an account of this procedure (the original article having been written by Lüppe-Cramer for a German journal), states that it will have numerous applications in photogravure, among which are the preparation of reversed negatives from the original negative, direct positives from documents and in photo-lithography. The fundamental principle is due to Renwick, whose results have recently been published in the *British Journal of Photography*. He found that a silver bromide emulsion can be desensitized by the action of a solution containing iodides and sulphites, without affecting the latent image, if hypo is also present in the solution. A second exposure to light destroys the original latent image, hence it is possible to obtain a picture in which the black and white exchange places, by using a plate that has been treated as noted. The experiments have shown that the method is of much advantage in obtaining direct positives for reproduction.

The sensitive plate (preferably a lantern slide or process plate) is exposed for a few seconds to diffused light in such a way as to cause a slight veiling should development at once be made. The plate is then immersed in the following solution (Renwick's formula):

Water	1000 c.c.
Potassium iodide	20 grams
Hypo	40 grams
Sodium sulphite, dry	20 grams

This operation should be carried out under a safe light, but subsequently a yellow light will be satisfactory. The plate should remain for at least five minutes in the solu-

tion, then be well washed in running water for about five minutes more and dried in the dark. The dry plate, having been given the proper exposure in the camera, must be developed by a very energetic solution. That recommended is an alkaline diamidophenol. Such a solution spoils quickly, and, therefore, must be made up only when about to be used. Development is complete in about five minutes. After rinsing, the plate should be fixed in a concentrated (30 per cent.) hypo, warmed to a temperature of about 95° F. At this concentration the gelatin is not liable to soften.

Lüppo-Cramer states that he has obtained a large number of negatives, under many different conditions, and that one can obtain at will copies with a desired degree of contrast. The image is the more contrasted and the plate the less sensitive in proportion as the preliminary veiling has been more intense, a circumstance which permits one to vary the character of the image as desired.

A New Developer

Information comes of the discovery of a new developing agent; the chemical composition is not revealed, going under the sobriquet of D. 50.

Whether this means that the number of agents employed hitherto in evolving the latent image from exposure is forty-nine, we divine not, as it would require some looking up.

Most of the developers are synthetic products and we believe of German manufacture.

We are not informed as to the genesis of D. 50, but we are told that it has been brought to birth by British chemists and from the enumeration of its high virtues it overtops all previous claimants.

It is said to be capable of doing more than any other single developing solution yet handled; as Dr. Gear remarks in the *British Journal of Photography*, it may lay claim to the wide term "universal."

As far as has been revealed, it is a mixture of compounds of the phenolic type not previously used for the purpose of development.

It has many strong points for recognition. Dr. Gear has employed it extensively and critically by a series of measured tests and daily practice.

It is economical, since it may be used again and again for either plates or paper without noticeable diminution of energy and

with perfect immunity from stain on paper, film or hands.

It keeps well, too.

The negative is colorless and it gives with proper exposure good range of gradation with transparency and any degree of density, even comparable in this respect with pyro.

It is free of chemical fog even with rapid plates and prolonged development. For bromides it equals the best recommended developers.

We await further developments of this wonderful developer.

Photography and the Small Arts

In the larger cities of France and Germany quite a good living is earned by a class of artisans who do all their work in their own homes, making and decorating various objects adapted for different purposes, and all with a show of much artistic taste. Their shop is their parlor, dining room and kitchen. Here they turn out glove boxes, picture frames, and other such trinkets, decorated with colored designs, and for a price which seems hardly commensurate with the apparent labor expended upon them.

You would be astonished at the various ingenious applications. For instance, we will take one of the decorated boxes. On the lid and on the sides of the box are what one would take to be nicely painted sketches of subjects delineated with skill and animation apparently much beyond the ability of such an artisan, but if one goes to the home workshop he will see the artisan take an ordinary silver print, made in the usual way, and place it against a window pane face downward, and then, with a lead pencil, sketch out the outlines of the image, the places where he intends to apply colors. This done, the proof is laid face down upon blotting paper and colored with water or oils in flat tints, no notice being taken of the half-tones, for the paper is made transparent with a preparation of castor oil and balsam of fir with turpentine. All that remains to do is to neatly paste the picture to the sides of the box and then varnish all with some light, hard varnish, like copal.

A method of making the photograph transparent (it must be a picture on plain or albumen and not on emulsion paper) is as follows:

Take castor oil (cold expressed), 1 ounce; alcohol, 1 ounce, and shake well together. Then add turpentine, 2 ounces; Canada balsam, 1 ounce. Shake all well together

and apply warm to the print, letting it lie in the solution for a day, when it will become translucent. The excess of solution is wiped off the back and face, and the print placed upon a sheet of glass, face down. The oil colors are applied on the back rather thick and strike through to the face of the print, thus representing in shadow of the color the half-tones. The print is then allowed to thoroughly dry and it is ready for application. The coloring may also be done on the face, if certain portions need slight touching up. Finally a coat of copal protects the surface.

Photography From a Moving Base

While the primary purpose of the hand camera is to enable the photographer to depict moving objects, it is also very helpful when we wish to photograph from some position which is itself in motion. The most frequent example is that of photographing from a boat. Many trips by water are taken amidst surroundings of a very tempting character; and even when it is possible to revisit what we are passing, and photograph deliberately from the shore, we shall never be able to occupy precisely the same viewpoint, and at the same time be on *terra firma*; moreover, it may happen that the watery viewpoint is the best. The hand camera in such a case is a necessity.

Tables of necessary exposures for various classes of moving objects have been published; but we do not remember having seen any tables or other information as to the exposures which are required when it is the camera itself which is in motion.

When working from a boat, we can formulate one general rule, and that is that, within limits, the smaller the boat the shorter must be the exposure. There are two reasons for this. The movement through space on a little boat may be very much slower than on a large one, but the angular movement in a given time is much greater and much more variable. In a rowboat a sudden movement of anyone on board may take the camera right off the subject at which it is directed, at the very moment of exposure. Again, the small boat is a much lower standpoint, and, therefore, much nearer objects are included, and the motion of their images on the plate is consequently much more rapid.

Working from a rowboat requires calm water, and any other persons in the boat must be asked to remain motionless while

the object is sighted and the exposure made. The need for this is all the greater, as in all probability the photographer may have to stand up, in order to get a good view of what he requires; and so a sudden movement may not only cause the photograph itself to be a failure, but may result in a ducking for the photographer. A thirty-second of a second will in all likelihood be the longest exposure which will be successful in a small boat; and if the water is at all choppy a hundredth may be required. Fortunately, in such circumstances, it is very seldom that we are dealing with a subject which has any heavy foreground shadows necessitating a long exposure; so that, in setting the shutter, we may be guided solely by what is required by the movement of the camera.

When working from the deck of a large vessel, especially in quiet water, circumstances are a good deal easier. It may very well happen that everything in the view is so far away from the camera that even if the boat is steaming at a good speed the motion of their image on the plate is quite slow. We have given a sixteenth of a second over and over again in such circumstances without any sign of movement. If it is another vessel near at hand which is to be photographed, and it is under way, or perhaps crossing the line of sight more or less at right angles, the exposure must, of course, be adjusted accordingly; but for the moment we are considering movement of the camera only.

On a steamer a hand camera often has one great advantage over a stand camera, or rather there is a great gain in holding the camera in the hand rather than in resting it on any part of the vessel. The ship itself may be vibrating under the stress of its engines; and if we bring the camera into rigid contact with the vessel, we communicate the vibration to the apparatus and get blurred pictures almost inevitably. Instead of resting the camera on the taffrail, therefore, we hold it in the hand, and the legs and body of the photographer so far deaden the vibration that it ceases to be troublesome. It is worth noting that different parts of a ship differ very considerably in this matter of vibration. Anywhere near the stern of a screw steamer it is much more marked than it is amidships or forward. On the upper deck, also, it is generally less noticeable than it is lower down. In a sailing ship there is usually no tremor or vibration at all, only the steady periodic rolling or pitching. The movement of the camera is least when a

roll is at its end, there is a kind of momentary pause before the motion takes an opposite direction. That is the best instant at which to make the exposure.

Snapshots are sometimes made from the window of a railway train in motion; but for this, in view of the very rapid vibration, no exposure can be too short. The camera must be held so as to exclude near objects as much as possible, on account of their very rapid apparent movement; but with the landscape generally, two or three hundred yards away or more, motion is slow enough for it to be ignored. The shutter must be set at its fastest on account of the shaking of the train itself. In this way, we have secured sharp negatives with an exposure of a hundredth of a second. But the subject changes so rapidly that the results are never more than mere curiosities; whereas, from a vessel, photographs of pictorial quality and value have often been made.—*The Amateur Photographer and Photography.*

Surveying from the Air

HAROLD B. SAY

Development of the airplane from a device that simply proved man could fly, to a machine vital in peace and war, and the advances in aerial photography achieved during the recent war, have combined to furnish the surveyor of continents with a new and highly valuable set of instruments. For the first time the annual report of the director of the United States Coast and Geodetic Survey devotes pages to this phase in map making.

Probably the work which most strikingly demonstrates the possibilities of aerial surveying is that done on the New Jersey coast between Cape May and Seabright. A single flight was made over the distance of 120 miles of coast line. Two hours were required for the trip. A total of 183 photographs were taken. Development of the films and the printing required two days of one man's time. The work of interpreting the photographs, assembling the mosaics, comparison with topographic sheets, and reduction to the scale of the chart of the outside shore line, consumed 15 days of office work by one engineer.

Had the work been done by a land and boat party, several men and several weeks would have been required to do the actual field work, to say nothing of the drafting-room labor. Most pertinent of all, the photographs taken during the two-hour trip are

now being used to revise the charts of the coast of New Jersey.

While the phototopographic experiments were being conducted at Atlantic City, aerial photohydrographic work was under way at Key West, Fla. Of this phase of the work, Director Jones reports:

"A well-surveyed area near Key West was chosen, and the vessels proceeded on parallel courses over this area at full speed, the plane flying forth and back above the course. The courses and positions of the vessels were recorded as in ordinary sounding work. The photographer in the plane recorded the exact time that each exposure was made, with other data, such as altitude, exposure, plate, filter, etc. Each photograph was later oriented by plotting the positions of the vessels on the chart at the instant the exposures were made.

"These experiments proved very conclusively that photographs from the air, using present-day equipment, are of little practical value to the hydrographer. When any of the underwater features did appear in the photographs, contrast in color was the most prominent, with no indication as to whether the contrast indicated shoal or deep water. Varicolored bottom, of uniform depth, appears in the photograph as apparent difference in depth. Many chartered shoals are not indicated in the photographs, while adjacent ones show clearly. Taken altogether, the results are so uncertain that the chances of eliminating field work in hydrography are very remote."—*Popular Mechanics.*

Photographing in the Himalayas

The Himalaya mountains are the highest in the world, the main peak, Mt. Everest, the highest peak so far as ascertained, rising to nearly 30,000 feet above sea level. The name of the range is of Sanskrit derivation, and means "snow-abode." A recent number of the *Journal of the Photographic Society of India* gives an account of expedition of a member of the society to some high points along the range. No doubt such a trip affords many opportunities for awe-inspiring and beautiful views, but picture-making above the snow line is no easy task. The whole journey of Mr. N. A. Tombazi, who made the trip, was 326 miles, but this included much travel on comparatively low ground. In this first part the heat was intense, but the abundance and variety of insect and plant growth were very striking. Ascending the range,

he stopped first at an elevation of 8,800 feet. Here were a monastery, a small collection of houses and a huge, gorgeously painted, praying wheel, weighing more than a ton. Tombazi was accompanied by a sirdar (a sort of captain) and twenty coolies, so that he was well provided with help. An uphill march through 13 miles of forest brought the party to a lonely spot on the border of the snow line at a height of 12,800 feet. Here some of the coolies were affected with mountain sickness, and further travel was postponed for a day. Later, the party pushed up beyond the limit of fuel-yielding plants, into the lower margin of the snow line, the region presenting no vegetation but a few dwarf rhododendrons and arctic plants. A few wild animals, however, inhabit the region. No shelter being at hand at this level, tents were used. The first camp was pitched at an elevation of 15,370 feet, sheltered in a rocky glen, but we are told that it became bitter cold at night, the temperature having fallen to 34° F. This does not seem very cold to those who live in the north temperate zone. Later, at one of the higher levels, the narrator speaks of a bitterly cold night with a temperature of 24° F. At a level of 17,300 feet lies a glacier lake, from which rises one of the peaks, 22,700 feet above sea-level, that is, 5400 feet above the surface of the lake, certainly a very beautiful sight. A reproduction of view taken at this point is given in the journal. The highest point reached by the party was 20,500 feet.

Combined Developing and Fixing

This topic has already been rather extensively treated in this journal, but some new information is presented by L. J. Bunel, in a paper read before the French Photographic Society, and published in *La Revue Française de Photographie*. Bunel's method dispenses with the special developers that the Lumière-Seyewetz formulæ give, using instead diamidophenol and acetone. The latter accelerates the action of the former. The formula is given as follows:

Acetone	80 c.c.
Diamidophenol hydrochloride	5 grams
Sodium sulphite, dry	30 grams
Hypo	50 grams
Water sufficient to make..	1000 c.c.

The exposure should be ample; as might be expected, such plates develop more

rapidly. Plates developed by this method compare favorably with those obtained by the special Lumière and Seyewetz methods. The intensity of the image is, indeed, rather superior, and the portions that have received the smaller amount of light are better brought out. Fog is completely absent.

Views in which there are strong, natural contrasts give the best results with this method. Transparencies with black tones are produced very well, and the combination of procedures is convenient. With a view of adapting the formula to under-exposed plates, Bunel tried adding alkali to the developer, but the results were not satisfactory. The intensity is low and fog makes its appearance. The subject deserves further investigation.

Preparation of Collodio-Chloride Paper

PREPARE the following solutions:

A

Strontium chloride (cryst.)	30 grains
Lithium chloride (anhyd.)	10 grains
Distilled water	68 minims
Absolute alcohol	150 minims

This solution must be kept well stoppered.

B

Silver nitrate	12 grains
Distilled water	16 minims
Absolute alcohol	30 minims

C

Citric acid (cryst.)	20 grains
Absolute alcohol	80 minims
Dissolve and filter.	

D

Pure glycerine	30 minims
Absolute alcohol	90 minims

E

Gun cotton	3 grains
Absolute alcohol	50 minims
Methyl ether	50 minims

Mix in the following order:

E	400 minims
A	10-20 minims
D	20 minims

Next heat C to 68 degrees Fahr. and add gradually 46 minims of B. Shake well with each addition and add 20 minims of C and 50 minims of ether (sp. g. 720). Incorporate well. This gives vigorous printing paper. If softer paper is desired, increase the contents of A, say, by twenty minims.

First Use of the Camera by a Painter

It is curious to trace the development of the art idea in photography. Canaletto's celebrated pictures of Venice, we are told, had their foundation as sketches made by the painter, who employed in his travels a sort of folding Kodak. So he really is the first of the many painters who use photography as an aid to art in the composition of their pictures. These pictures of Venice in the seventeenth century are said to impress one with the fact that their effect is what the painter contemptuously terms photographic. That is, they look like painted photographs, or as if painted direct from the photograph. The influence of the artist's photographic studies, as we may call them, is very marked in these quaint and picturesque transcriptions of old Venetian life. Street scenes, public festivals and popular tumult seen against a background of faithfully rendered architecture.

Canaletto is not accounted a high ideal painter, but his work certainly appeals to the photographer with artistic instinct. What the French call "actuality" is his distinguishing characteristic. He realizes for the spectator all the conditions of the life amid which he lived and moved. He did not reflect its higher side like some of the great creative minds of his period, but he gives us in refined realism what he actually saw.

He did on canvas what the realistic playwright does on the stage, and his modernness is what links him to us of the present, when art consciously or unconsciously is being influenced by the work of the camera.

Radioscopic Examination of Mind as Well as Body

Its name, "phrenoscope," exactly describes a new French X-ray instrument to those who have a knowledge of the dead languages, for the term is composed of two Greek words meaning a view or survey of the mind or diaphragm, and this is precisely the purpose of the instrument, says the August *Popular Mechanics* magazine in an illustrated article. It makes possible a radioscopic view of any opaque object, and in the case of the human body, enables one to see distinctly the diaphragm—the membrane that separates the chest from the abdomen, dividing thus the body into two compartments. This membrane, although very slender, is muscular, and it vibrates constantly under the action of respiration. It is claimed that these movements of the diaphragm act in

unison with the mind, or brain, and therefore a study of the diaphragm in this manner makes possible an analysis that is mental as well as physical. Indeed the French originator of the instrument asserts that he can read the character of any human being, when placed behind the screen of his instrument so that the diaphragm is fully exposed to view. That there is some basis for this assertion has been definitely proved by a number of actual tests that were very successful.

Removing Uranium Intensification

AN alternative to the use of soda carbonate or ammonia for the restoration of a uranium-intensified negative to its original state is recommended by Karl Gander in *Wiener Mitteilungen*. The negative is washed by soaking in successive changes of still water until the water shows no yellow tint after the plate has remained five minutes in it. The plate is then placed (not in bright light) in a 2 per cent. solution of silver nitrate in distilled water, which is allowed to act until the negative on the glass side has no brown color, i. e., is completely black. The plate is then washed. It is not evident what advantage this method has over the much more rapid treatment with alkali.—B. J.

No Slides Necessary for New Daylight Projector

A projection lantern which photographs directly from the object itself, dispensing with slides altogether, has been invented by a French physicist, and is described with illustrations in the August *Popular Mechanics* magazine. A remarkable feature of the apparatus is that it operates in broad daylight, there being no luminous cone and darkened room necessary, as in the case of the ordinary magic lantern.

Any object of suitable size may be introduced into the lantern—an open book a stone, a set of beads, or a text, rolled and unrolled on a couple of spools. By means of a set of condensers of one or more lenses, and reflectors at the back of the source of light, the object is photographed upon the screen with microscopic accuracy, it is claimed, the whole force of the light pouring upon the object and reflecting through the lenses to the screen, or any place in the room, from a mirror which swings on an axis.

Worth of Direct Intention

It does not seem wise to us for one to trust to contingent success, when it might be secured by direct intent. On the initial proper management of the light, success primarily depends.

Proper direct illumination is the crucial test of a good operator. This does not imply that the operator may not make use of whatever means attainable to improve the mechanical phase. He would be unjust to himself, as well as to his client, if he did not avail himself of all possible means to exploit his artistic intention.

Whatever light falls upon it must affect it in a certain way, subject to mechanical laws of optics, and it is the province of the photographer who starts out with the intention of making a characteristic portrait to predetermine what he may do with his illumination. To pursue a method which gives approximation only of what he expects is bad practice. To wait until the negative comes out to see if it expresses his intentions, and if it does not fully come up to expectation to have recourse to chemical, mechanical or even high art means of remedy is really to wait until it is too late.

It is most laudable to be obsessed to repletion with high artistic aspirations, but one must not forget that photography has also a mechanical prerogative which may not be ignored or even slighted.

What "Not" to Do

It is, of course, impossible to indicate what always may or may not be done in every individual case. The operator must diagnose skillfully to apply the proper remedy. But we may say this, that it is most important to bear constantly in mind "What not to do, rather than what to do."

A keen observer may do much to improve the model where there are deflections from the normal without materially departing from the presentation of the true likeness, but there is danger in the exercise of this privilege if he be not possessed of feeling as well as good judgment.

The greatest danger we venture to say is the tendency of leaning for support too much on the mechanical aids allowed. We feel assured that the results are going to turn out indifferent when we hear a photographer make the remark: "That will be a fine thing if it is touched up a little." A true pride in his art would preserve him from such a mistaken idea of improvement.

Further Notes on Development in a Bright Light

The recent publication in Germany of Dr. Lüppo-Cramer's researches on desensitization in book-form—a small volume which is one of the most important appearing since 1914, and which should be translated and so made generally available without delay—affords an appropriate opportunity of again referring to this subject. The process of desensitization, despite the drawback attendant on the staining of the gelatine film, is rapidly becoming popular amongst amateurs who, as a class, are perhaps less conservative than their professional brethren. The professional worker will follow in due season and enjoy the comfort and other advantages of a really light dark-room illuminated by reflection from the ceiling with light passing through, for example, the Wratten "O" safelight. Amongst club amateurs the subject of removing the stain from desensitized plates in being constantly discussed, the consensus of opinion being that running water after an acid hardening-fixing bath is the most reliable method to employ. It will be frequently noticed that a desensitized plate will wash to a colorless stage, but on drying, a bluish-violet tint is developed. This appears to occur most frequently when the Desensitol has been used mixed with the developer. As will be seen later, all staining of the gelatine can be obviated and the fastest of plates developed in comfort.

Ability to develop in bright light is not the only effect of desensitization. In addition there are some remarkable effects which cannot fail to have been noticed by the photographer of catholic taste in developers. The most striking of these phenomena is perhaps that of the acceleration of the rate of development by hydroquinone. The slow-acting, low-Watkins-factor development characteristics of hydroquinone are too well known to necessitate comment. The presence of Desensitol, either in the film as the result of preliminary bathing, or in the developing solution itself, causes this developer to behave like metol—the image as a whole flashes up in a few seconds and density is only obtainable on raising the factor some fourfold. The magnitude of the development disturbance in the case of hydroquinone appears to be considerable; with most of the other developers retardation of the reaction occurs, the amount of which varies considerably according to the desensitizer employed.

With phenosafranine as the desensitizer, and leaving hydroquinone development out of consideration, the disturbance of development speed is, as far as the writer is aware, less than with any other of the compounds—developers or dyes—of which Lüppo-Cramer gives a list in the book already referred to. The majority of workers, however, will experience no inconvenience from this development effect, for when using Desensitol and an average M-Q developer there is practically no difference in either the time of appearance or the Watkins factor between a plate bathed in the dye solution and one simply soaked in water before development. With other developers this is not the case, as the following figures, in obtaining which a preliminary bath of 1:50 Desensitol was used, will clearly indicate:—

With pyro-soda time of appearance alters from 95 sec. to 60 sec.

With pyro-soda factor of appearance alters from 12 sec. to 8 sec.

With amidol the alterations are 6 sec. to 14 sec., and 18 to 12 respectively. In short, desensitization, except in the case of an M-Q developer, completely upsets all figures hitherto recommended for factorial development. This may appear perhaps to be a matter of but small moment, but when it is noted that for a given gamma the total time of development is radically altered it is evident that the matter is of practical importance even when Desensitol is used as the preliminary bath. "Even when Desensitol is used" needs emphasizing, for there are at present on the market plates which are backed with red backing the dyes in which, in one case at least, are powerful desensitizers and which exert considerably more influence on the rate of development than either phenosafranine or Desensitol. Therefore more specific information on this point which I now give will perhaps be appreciated.

The most efficient desensitizing backing I have so far met with is that designated "Transparent," with which Messrs. Kodak, Ltd., back all plates except the panchromatic. So active are the dyes used in this backing that if the backed plate be bathed, either in the dark or in a "safe" light for a minute and a half in water (1 oz. to a $\frac{1}{4}$ plate) the development may be subsequently conducted in the light which is usually employed when working with bromide papers. Even with an ultra-rapid plate no fog whatever appears during five

minutes' development at 36 in. from an "O" safelight, the illuminant behind which is a 32 C.P. tungsten wire electric bulb. Although treating the plate in water before development leads to the greatest depression of sensitiveness, it is not necessary, as the developing solution itself rapidly dissolves the backing (a strip of glass cut from an old negative and placed under the negative at one end of the dish will ensure access of the developer to the backing) and desensitizes the plate. The adhesives in the backing necessitate a somewhat longer time being devoted to the desensitization than when a plain aqueous solution of dye is used, but one and a half minutes is quite sufficient to do all that is required. In this time, using water as the solvent of the backing, it was found that the speed of the plate was reduced to approximately 1/250th of its original value, and when using the developing solution as the solvent, to 1/200th of the original value. Whichever method of working be adopted the plate leaves the developer with its film unstained, and there is nothing in the finished negative, other than the complete absence of fog, to indicate that a desensitizing bath has been used in its production. It must have been obvious to many that this "backing" variation of desensitization would come into vogue, but that for several years self-desensitizing plates were on the market, was not even suspected, although the statement that generally plates were nothing like so sensitive after they have been in the developer for a minute or two may be attributable to this fact. It may be noted, *en passant*, that the supply of dye in the backing is so liberal that the solution made by using 1 oz. of water per $\frac{1}{4}$ plate will effectively treat three or four $\frac{1}{4}$ plates. A source of supply of desensitizing solution is thus ready to hand with every box of plates coated with transparent backing. The incidence of these backings may also be responsible for many of the conflicting statements which have been made regarding factorial development, for unless the backing is removed by means of a damp sponge before development, it may be safely stated that the Watkins factor may depend more on the vigor with which the dish is rocked than on the particular developer employed.

With regard to the action of desensitizers on the latent image, doubts have been expressed as to the accuracy of Lüppo-Cramer's statement that this entity suffers no destruction during desensitization. As far as my experience goes, the statement is

one of fact. It must not be forgotten that comparative tests in this work are not quite as simple as usual to carry out. The factors of wetting the plate before development and of considerable disturbance of the rate of development both enter into the matter, and their effects have to be eliminated before any conclusions are drawn as to destruction of the latent image. I believe that the suppression of tendency to fog in development allows of the fullest realization of the speed of any emulsion—comparative experiments leave little doubt that the faintest shadow details can be developed more strongly on a desensitized plate than on one not so treated. In other words, the effective sensitiveness of the emulsion is enhanced—the H. and D. speed probably remaining unaltered—by desensitization. The entire absence of fog further allows of the negatives being very cleanly intensified, a fact which should be of interest to astronomical photographers who are always demanding greater sensitiveness.

Before leaving the matter of self-desensitizing plates, a note of warning should be added: the wrapping paper should never be allowed to come in contact with the face of the plate before exposure as there is a risk of the paper's being contaminated with some of the dye. It may be safely assumed that if the backing has been transferred to the paper it is sufficiently moist to desensitize the emulsion, with disastrous consequences in the subsequent exposure.

As was mentioned in the former article, the oxidation products of many developers are desensitizers. Amidol, for example, at a concentration of 1/2000 will reduce the sensitiveness of a plate to about 1/200th of its original value, even although the solution be freshly prepared and hence contains but a small proportion of oxidation product. It is significant that in the case of these products sulphites entirely prevent desensitization. It is also remarkable that in the case of amidol the product which is formed by complete oxidation does not desensitize at all, but, on the contrary, induces red-sensitiveness. This product is essentially different in chemical constitution from those dyes which are used to prepare panchromatic plates, and although oxidized amidol as a red-sensitizer is of no practical value the knowledge of its action may stimulate research with similar compounds. Very little has been said with regard to the theory of desensitization, and, indeed, up to the moment there is very little to say about it. Dr. Lüppo-Cramer has recently informed

me that the action is one of oxidation, and he has promised particulars of some interesting confirmatory experiments at some future date. When these particulars come to hand they may, if circumstances permit, form the subject matter of a further short communication. In the meantime it behooves all who can do so to make themselves acquainted with the contents of the small book referred to at the beginning of this article, as it contains very much more information than can possibly be condensed into one or two articles of the present type. —Raymond E. Crowther, in *"The British Journal of Photography."*

Insure Fixation

The deterioration of the negative within a short time after its genesis, as well as the maladies which manifest themselves when methods of improvement are attempted (intensification, reduction, etc.), may be traced to improper fixation of the developed plate.

We are in receipt of so many letters inquiring what is the cause, or how to obviate or remedy the mishap, that we think a note of advice here pertinent, even though we have repeatedly given it, because the caution is not generally heeded.

For the elimination of the unaffected silver salts in the developed plate (the necessity for which is obvious), no chemical reagent has ever been found which can be substituted for "hypo." It seems to have been specially designed for photography. As an excess of hypo in the solution is absolutely demanded that it may do the yeoman service which it does, never economize by using a weak solution.

Hypo is its established name, and it will ever retain it, but its chemical name is sodium thiosulphate—not hyposulphite. It acts upon the silver salt by first converting it into thiosulphate of silver, which is practically insoluble in water; then forming a double compound of sodium and silver thiosulphate. Rather, there are two of these double salts—one with the smaller proportion of the sodium salt is sparingly soluble in water, while the other is quite soluble.

It is, therefore, only this last-named product which is of service, and to ensure complete conversion of all the silver bromide into it we have to have a large excess of the sodium salt (hypo).

If the fixing bath is too weak or gets exhausted by use, or if it is not allowed

to act long enough, though the negative may look clear and you may think it perfect, there is still some unaffected silver which is so tardy in dissolving that even good washing of the negative fails to dislodge it.

The moral we want to inculcate here is, be careful to properly fix the plate, and, when the hypo has done its work, speed the parting guest with copious draughts of water—in other words, wash thoroughly.

Chemical Fog Exposure Development

A correspondent writes to ask the reason why an unexposed gelatin plate, submitted to the action of the developer, produces a fog (chemical fog) of more or less intensity, whilst a plate from the same box, normally exposed and developed under like conditions as the unexposed plate, gives a negative free from fog.

We confer at the start that we can give no positive reason, but the query recalls some investigation, made about ten years ago by Messrs. Lumière and Seyewetz.

Their experiments were carried out on very rapid plates, and the influence methodically studied of certain factors on the production of this particular fog.

These factors were length of exposure, duration of development, nature and composition of developer.

Diamidophenol 5 grammes
employed, its composition as follows:

Water 1000 c.c.

Diamidophenol was the developing agent

Sodium sulphite (gran.) 30 grammes

Temperature, 18 degrees C.

Time, ranging from one to ten minutes, on plates, unexposed, normally exposed, over- and under-exposed.

In the case of the under-exposed plates, the chemical fog does not appear, when the duration of development is less than one minute, but is very apparent at two minutes, increasing rapidly thereafter.

In the case of the normally exposed plates, fog only appears after ten minutes' development.

All other conditions being equal, the shorter the length of exposure, the denser the fog.

With the same constituted developer, but at a temperature of 25 degrees C. instead of 18 degrees C., it was observed that the difference in intensity of fog, between plates developed beyond two and a half minutes, increases in both cases with duration of development.

No difference is presented in favor of the exposed plates, until the development is prolonged to ten minutes or thereabouts. As before, the shorter the exposure, the denser the fog.

As to the nature of the developer employed, the preceding experiments were repeated with different alkali content.

"HYDROQUINONE."

Hydroquinone 10 grammes

Water 1000 c.c.

Soda sulphite (gran.) .. 40 grammes

Soda carbonate (dry) .. 55 grammes

"PARAMIDOPHENOL."

Paramidophenol 20 grammes

25 per cent. solution an-
hydrous sulphite (1000 c.c.)

Caustic lithia 8 grammes

Examination of the differences presented by the composition of the same developer, according as exposed or unexposed plates are treated by it, shows that in the former case the solution contains sodium bromide, the quantity of which is greater when exposure of the plate is longest and development the most prolonged.

This result is not had in the second case, since the reduction of the silver bromide (which is slight) is only limited to formation of fog.

It may therefore be supposed that the slight intensity of the fog produced on exposed plates, compared with that of unexposed ones, as well as the increase of intensity with under-exposure, is due simply to the restraining action of the alkaline bromide formed during development.

In order to verify this supposition, the experimenters repeated their experiments in connection with unexposed plates, adding to the developer a quantity of alkaline bromide, about equal to that formed in the development of a normally exposed plate.

They found, also, that the unexposed plates only give fog similar to that obtained with exposed plates, which looks like a further confirmation of their theory.

Luminosity and Color

Luminousness is the intensity of light impression upon the eye, while color is the quality as affecting the sensitive plate.

The yellow rays are apparently the brightest; the red and blue do not seem as intense, so the eye estimates the luminosity not solely in regard to the amount of light present, but also according to the prevailing color.

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GOOD EXPRESSION—JOHN BARTLETT

[E]VERY one who has ever had a portrait taken is conscious of a certain amount of self-glorification. It is so like having oneself recreated with all the modern improvements, that naturally one feels puffed up with delight in the reduplication of his majesty himself.

Now, it is just this self-consciousness which destroys what is natural and unaffected in our character and makes us assume a virtue whether we have one or not, and to mirror on our faces not what we in truth are, but what we would have ourselves be.

We are anxious to persuade our fellow kin, subject to like passion, that we take no enjoyment in having ourselves limned forth for future generations, that the operation is unpleasant to us and that we condescend, only to gratify our friends. Yet within that brief interval of time while the chemical change is taking place in the sensitive film we would feign be an Adonis or an Ariadne. The very beggar or fakir in the streets, whose face has more lines of humiliation and dejection than a frilled negative, when invited into our studios and made to understand that we have discovered some elements of the picturesque in his make-up at once

“Drinks up the monarch’s plague, this flattery.”
and reflects on his self-satisfied countenance the consciousness of his newly acquired importance. These pleadings of self against oblivion are almost pathetic. Who has not met troops of eager ones who seek by every artifice to find a nook or corner somewhere in the scene we are endeavoring to photograph, though full well they know the improbability of ever getting a glimpse of the picture.

Is it any wonder, then, that the power to make a good portrait is sufficient to establish a painter’s fame?

Michael Angelo did not paint portraits, we are willing to admit, but what glorious portraits has he given us in the statue of Julian de Medici and in the mythological sibyls and the prophets.

In his historical subjects as well as in the religious we find all those qualities in the highest degree which make a true portrait. Da Vinci's Mona Lisa, Titian's Mistress and Holbein's Erasmus are sufficient to show the wonderful powers these painters possessed, and yet what are these pictures, mere portraits. Mere portraits. Yes and no.

Mere portraits because they bring out the peculiar marks of originality—the permanent characteristics which indicate the disposition and the habits of the real self—more than mere portraits because they show the mind's discernment in the face.

The portraits which Reynolds and Van Dyke painted of the distinguished people of their day look very like the models they represented, or you may be sure the friends of the models would have protested, for the finest painting in the world if it be not a true likeness will never satisfy that vanity which is the common failing of the race. An idealized portrait, however beautiful, is not the man. There is something weird about it, just enough of a resemblance to make it uncanny. We do not like to be left alone in a room with it.

A portrait must have depicted considerable of our earthly nature, the vulgar quality of faithful likeness, to give it even standing room in our candid appreciation of ourselves.

But what is this mirroring of the soul in the face and how are we to secure it along with the fleshy envelope—the muddy vesture of commonplace reality?

Leibnitz tells us: "All that takes place in Cæsar's soul is pictured in his face." We must look for the character in the expression and not judge of the traits of the man by generalizing on his features. Because the Roman soldier is represented with an aquiline nose should we expect all warriors to have a beak?

The Greeks could never understand how the soul of Socrates was put in the body of Silenus, but doubtless the philosopher looked beautiful to his disciples when his great mind pierced through the disguise.

It is not meant that a portraitist should be a physiognomist or a phrenologist, but he should be able to judge of character through the signature of the features in action or in repose.

Thick or compressed lips, open or sunken eyes, straight or hooked noses, may enable one to roughly line out a disposition, but the nicer distinctions of character must be read from the expression, which often contradicts the assertion of the physiognomist. The human face is a most complex thing. It is not one nor does it remain for an instant the same when animated by thought. It is the stolid immobility of a wax head where the resemblance to the human skin is so perfectly counterfeited, which always disgusts us.

Not only does the light and shade upon the face change its expression every moment, but the slightest alteration of position indexes the thought going on within the mind. Each feature is in constant motion and contributes its share to the general expression. If, for instance, we should depict on one day the



"OLD AGE"

FRANK W. MEDLAR
SPENCER, IOWA

Winner of the Hetherington Competition Prize for
Pictures of Old Men or Old Women.

Subject was within nine weeks of one hundred years
old the day the picture was made.

expression conveyed by the turn of the head or the look of the eyes, and the next day delineate the mouth expressive of a new state of mind, how incongruous the result would be. Yet this is just what mediocre portrait painters do, and then wonder why their sitters are dissatisfied with the result of their conscientious pains and toil.

They have not the ability to conceive as a whole the harmonious blending of the features. They have no imagination. Their portrait is a man of shreds and patches, a veritable human crazy quilt.

Photography at its worst is consistent in its delineation. The expression may be vapid, dull, stupid, silly, simpering, morose, ferocious, etc., but we find a concord in all the parts. A truthful portrait is a perfect reflection of the inner man at his best, and true portraiture is within the scope and power of instantaneous photography.

But the operator must be a man of culture, a man of refinement and taste, and must possess the power to divorce the attention of the sitter entirely from the idea that he is going to have his picture taken.

An artist must be one in thought, word, and deed, or he is unworthy his calling. Wherever he goes his eyes should be open to acquire something useful in his profession. It is a delightful study, to watch the play of emotion or thought upon the countenance. An omnibus or a railroad station is a theater with marvellous actors, each playing his part with consummate skill.

Do not err in imagining that human nature may not be studied within the narrow confines of even a village photograph gallery.

If the portraitist has no other resource than to judge of a man's moral or intellectual nature by his physique, he may yet guess truly at the character by observing some attitude or motion which reveals the disposition, and, taking this as his cue, successfully call forth the true nature of the man.

To be painted or to be photographed, with the great mass of humanity, is synonymous with being put out of the natural environment in which they live and move and have their being. The preparations are elaborately made for the ordeal; the courage is screwed up to the sticking point, so as not to fail at the critical moment, the advent of which is announced by the operator with all becoming dignity, who stands beside his camera like a sheriff's clerk to take advantage of the distress of his victim.

Now it is just in the operating room—the very word reminding a sensitive nature of a clinic—that the skill of the photographer comes into play, in removing all constraint, in dissipating the feelings of nervousness or solicitude as to the result. Let the operator listen with all patience and meekness of soul to the admonitions, the desires, the demands of his sitters; let him seemingly acquiesce, seem delighted with the suggestions, nay, even compliment the excellence of taste, the perfection of judgment, but withal, let him pursue his own way with diligence, knowing that the notions of the one who sits enthroned are but as sounding brass and tinkling cymbals to his attuned ear for the hidden harmonies he is all the time calling forth in the unconscious subjects.

And finally, when the glorified expression of self-satisfaction, the beauty of pleased vanity, the ripe perfection of delighted expectation are reflected upon the face, let him squeeze the bulb which releases the shutter, and leave the rest to the chemicals; and, when the sitter comes to look at the finished work, let him acknowledge, with all due resignation, with profuse gratitude, the exultant intimation that the success of the operation is due solely to his or her advice and suggestion.

Such a procedure may be a terrible extinguisher upon the operator's self-esteem, but if pride is above the desire for success let him give it better scope than it can have in the photographic professions. The perception of the beauty of animation which transfigures even a homely face under the treatment we suggest is its own infinite reward. It is like gathering figs of thistles.

PHOTOGRAPHY IN AUTUMN— WILLIAM S. DAVIS

THE fall months bring both opportunities and limitations to the photographer—opportunities in the form of some attractive subjects characteristic of this season of the year, and the limitation of being unable to represent in a monochrome photograph the brilliant coloring of the late foliage—the yellows, reds and golden browns which lend such a glow to the landscape upon sunny days.

Owing to the inability of the camera to reproduce color by ordinary methods, the only way by which the season can be indicated conclusively is the selection of subject-matter not to be found at other times. Such subjects as harvest scenes, still-life studies of farm or orchard products which ripen in the fall, and compositions in which the wild flowers of the autumn fields, such as goldenrod, etc., constitute a prominent foreground feature, convey the desired suggestion.

With the average landscape it is difficult, if not impossible, after the scene is translated into monochrome to tell whether the picture was made in the autumn or spring, since there are periods during each of these seasons when the thickness (or thinness) of the foliage gives practically the same effect in a photograph, though to the casual observer the resemblance would not be thought of on account of the great difference in coloring. Sometimes, however, the foreground can be made to convey something of the effect desired by means of dry grasses, or freshly fallen leaves, which possess a crispness not found in spring after the snows and rains of the preceding months have reduced the lighter undergrowth and leaves to sodden masses. To show such dissimilarity, the material must be near enough for the individual details to be defined, perhaps the best conditions for this being found in the woods, when the undergrowth is not thick enough to obscure the carpet of leaves around the roots of the trees.

It is not always necessary from the artistic viewpoint that a photograph

should show at just what time in the year it was taken, and if one is not aiming to make pictures suggestive of the season, the problem is much simplified, since the autumn months afford an agreeable time for general out-of-door work, the bracing air often being more conducive to taking long "hikes" in search of good subjects than is the case upon a hot summer's day.

Beautiful atmospheric effects are of frequent occurrence, the white mist of early morning when the rays of the sun are just beginning to evaporate the dew or white frost deposited during the night, the golden haze on an afternoon in "Indian summer" casting a luminous envelope around the landscape, and the wind-blown cloud masses hurrying along on a crisp day in late October or November, any of which invite the photographers' skill to record.

The main point in selecting material is to avoid being deceived by the color, for even though certain tints are represented by the correct relative tone of grey in the photograph it does not follow that the result will always be satisfactory, for the reason that such colors as bright yellow, orange and scarlet exert upon most people a psychological impression of intensity greater than their actual luminosity, relative to other colors. For this reason, those who find it difficult or impossible to judge the relative tone-values of different colors



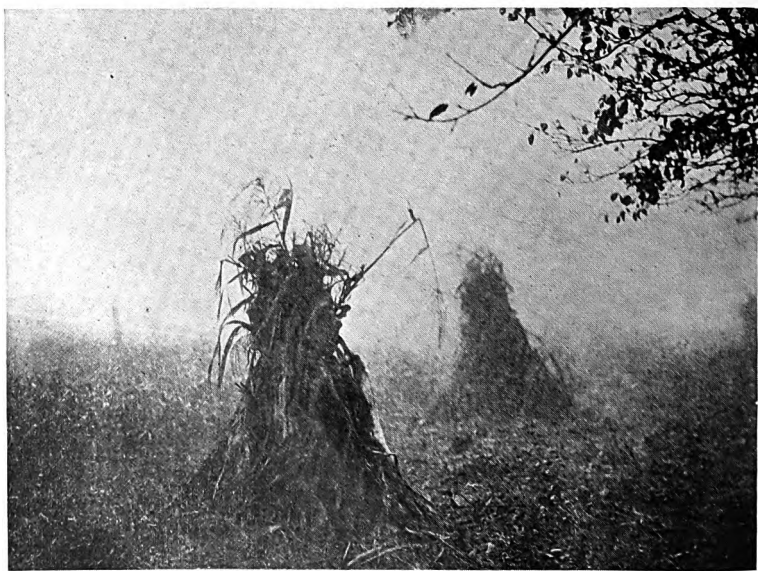
"AUTUMN SUNSHINE." WILLIAM S. DAVIS

will do well to view the subject through a tinted glass—blue or blue-green being suitable. This reduces the varied tints in a scene practically to monochrome.

Having found a subject in which the actual tone-contrasts accord sufficiently well with the visual impression to convey a similar effect, it still remains to transfer these gradations to the sensitive emulsion of plate or film. Unfortunately, the natural tendency of photographic emulsions is to reverse the effect seen by the observer—orange and red, for example, being rendered dark in tone, while a deeper blue or violet comes out much too light in value. However, the modern worker has the means at hand for correcting this which was unknown to the early photographers—I refer to color-sensitive emulsions used in conjunction with suitable corrective ray-filters, which give very satisfactory results.

Practically all roll film and film packs now used possess orthochromatic quality to some degree, *i. e.*, they are reasonably sensitive to yellow and green, and some makes show a certain degree to orange. The same, of course, applies to orthochromatic and isochromatic plates, obtainable in single-coated and “non-halation” grades, and to several brands containing the equivalent of a light-colored ray-filter in the emulsion, which are sold under such names as “Anti-Screen,” “Non-Filter,” etc. These latter can be used with a ray-filter on the lens, just the same as other ortho plates, when greater color correction is desired than is produced without.

Used in conjunction with yellow ray-filters, requiring from four to eight times increase in exposure, orthochromatic emulsions will give excellent tonal



"OCTOBER MISTS." WILLIAM S. DAVIS



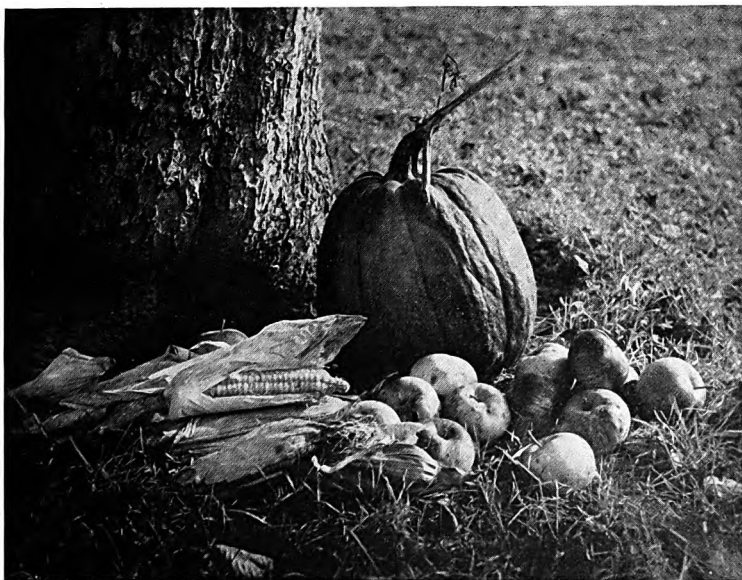
"MARGIE."

KARL TAUSIG

rendering of the average autumn landscape, but a liberal exposure should always be allowed, not only sufficient to cover the increase called for by the grade of ray-filter employed, but enough to balance the prevalence in the scene of the less actinic colors, and the yellow quality so often present in the light. The brightness of the tones representing the yellow, orange and russet tints can be heightened by the use of a deep-colored filter, but if more than an eight-times one is employed, the over-correction resulting is likely to give an unpleasant effect if much of the sky is visible, since blues and violets are represented too dark, resulting in loss of atmospheric quality.

To obtain the best possible rendering of bright orange and red tints, such as seen in the immediate foreground, unmodified in purity by a wide space of atmosphere, such as softens the colors in an open landscape, panchromatic or trichromatic plates are needed, especially when such colors are seen with their complimentaries. Such plates being sensitive to all colors of the spectrum, including deep red, they give greater correction with a filter of medium strength than is obtainable upon other plates with a very deep one, and where reds are an important part of the color scheme give results quite unattainable by other means. Those accustomed to developing their negatives by timing will not encounter any special difficulties in manipulating panchromatic plates in darkness, but to insure negatives of uniform quality it is advisable to employ a good exposure-meter as a guide in timing exposures.

In the illustrations shown strong reds and orange tints were absent, so the Iso and "Anti-Screen" plates employed gave very good renderings of the subjects. "October Mists" brings out a point previously mentioned regarding



"FROM FIELD AND ORCHARD." WILLIAM S. DAVIS

the selection of material which expresses clearly the sentiment of autumn, representing as it does corn-stacks, which are seen at no other season. This was taken against a morning light with an exposure of 1-10th second, using a lens of 6 inches focus at $f6.3$, the plate being a Wellington Anti-Screen. The material used for the composition called "From Field and Orchard" is also strongly suggestive of "mellow autumn charged with bounteous fruit." This study was secured on a November afternoon against hazy sunshine, an exposure of 1 second being given with a lens working at $f16$, using an Ingento, series "A," ray-filter and Cramer instantaneous Iso plate. "Autumn Sunshine," as reproduced in black and white, does not show as clearly as the other two the autumnal character of the material, being more dependent upon color in conveying a definite impression. The crispness of the leaves and twigs in the foreground help somewhat, however, and a cream-toned sepia print heightens the effect very much. The negative was obtained on a pleasant day in October at 3.35 P. M., the sun being low enough to cast good shadows, yet not so near the horizon as to throw the foreground entirely into shadow, which may happen in such scenes at a later time of day. Three seconds was the exposure allowed, using stop $f8$ Ingento ray-filter and instantaneous Iso plate.

Judicious selection of the color of the image of a monochromatic print is frequently of considerable assistance to the photographer in suggesting the prevailing tints of the scene.

SULPHITES AND SULPHATES

THE various chemicals used in photography under the names of sulphite and sulphate of soda, hyposulphite, thiosulphate, sulphide, and so on, are confused by some of our readers, so we have undertaken to show their relations and differences in this article. Much of the information has been suggested by letters to our question and answer department.

Sodium sulphite is the chemical used as a preservative in modern developers. The solution would otherwise spoil rapidly by oxidation and discolor and stain the negatives. Not only does the gelatine stain, but the image itself has a different color, according to the sulphite present, an important factor in negative printing quality.

In the older days, acids were used to preserve the developing agents in stock solutions. Sodium sulphite was introduced in 1882 by Berkeley. It was added to the developer as a control of stain and color of the negative image. With pyro we keep the stock solution acid, as alkaline pyro is hungry for oxygen when in solution. Oxalic or sulphuric acid is in common use. When the developer is mixed for use with the alkaline portion, the sulphite, by its action, exercises control over stain of gelatine and of the developed image itself. Reducing sulphite tends towards more yellow images, which take longer to print. Decreasing the amount gives colder tones. Sulphite solutions have some solvent effect on the silver salts, which probably accounts for its action.

With the advent of the modern developers, sulphite was found to have

another function. With some of these it works as an alkali. With amidol we can use sulphite without any carbonate at all. Amidol is more soluble in sulphite solution than in plain water. Metol is more energetic with sulphite only than with carbonate only without sulphite, thus proving out its developing function. In metol developers, metol is added first, followed by sulphite, the reverse of ordinary practice.

Sulphite is derived from sulphurous acid, the formula of which is H_2SO_3 . This is produced by solution of sulphur dioxide gas in water, the gas having the pungent smell of a burning sulphur match. It is the delightful odor we meet with in towns where newsprint paper is made from wood pulp.

The sulphite is made by passing the sulphur dioxide gas into a solution of sodium carbonate, common washing soda. When the solution is thoroughly saturated, the sulphurous acid formed breaks up the carbonate. The crystals of sodium sulphite crystallize out, which have the chemical composition $\text{Na}_2\text{SO}_3 + 7\text{H}_2\text{O}$.

The water of crystallization of sulphite can be expelled by heat forming the desiccated or anhydrous variety. Crystal sodium sulphite should be kept in air-tight containers, as the tendency to spoil is greater when the container is but partly full.

Recrystallized sodium sulphites are purer than the crude crystals, as with all recrystallized products. While it is called neutral sulphite of soda, this refers only to its chemical constitution, in distinction to the bisulphite or acid sulphite mentioned later, and it actually shows an alkaline reaction with red litmus paper.

Anhydrous means free from water. In this form, the chemical keeps better and takes up less room. It is stated that perfectly pure anhydrous sulphite does not deteriorate in dry air.

When exposed to the air, a white coating forms on the crystals. The sulphite takes up an atom of oxygen, forming sodium sulphate, Na_2SO_4 , also known as Glauber's salts. Crystal sulphite loses one-fifth of its sulphite within a few months.

There is also evidence to show that other complex compounds are formed, such as dithionates, at intermediate stages, but the end product seems to be the well-known sodium sulphate.

The effect of the sulphate impurity is accumulative. As the chemical oxidizes, more sulphate forms. This takes up water and actually restrains when it gets into the developer solution. Since the sulphite ratio is reduced, the tendency to stain is greater. Any carbonate impurity adds to the carbonate of the developer formula, making it stronger. Carbonate impurities of four or five per cent. are expected. The more free from carbonate, the better will it preserve amidol solutions. Hypo, of course, acts as a solvent of the undeveloped silver salts.

There are several rough tests for purity of sulphite. You can judge somewhat by appearance. The crystals should be clear and not powdery on surface. Fresh sulphite has the pungent sulphur odor. Such crystals are probably good.

For sulphite you can test by dissolving 30 grains in 1 ounce of water and adding 1 dram hydrochloric acid, chemically pure. Then add some barium chloride or nitrate, to maximum turbidity. A precipitate of white barium sulphate will show in proportion to sulphate present. There is always a slight turbidity, but a distinct precipitate is formed if there is considerable sulphate present.

The precipitate may also contain barium carbonate, from the sodium carbonate impurity, but this dissolves quickly in the hydrochloric acid, whereas the barium sulphate will not.

With sulphuric acid, the chemical will effervesce with the sulphur odor if sulphite is still present. If it has changed entirely to sulphate, there may still be some effervescence, without odor, from the sodium carbonate.

If you get mixed up, and in doubt as to which solution is sulphite or carbonate, a drop of acid to a small quantity of each will identify as above.

Sulphite partly decomposed may be recovered by taking advantage of the much greater solubility of the sulphite impurity. Place the sulphite in a graduate with a little warm water, rinse for a few seconds, then pour off the solution and dry the clear rinsed crystals on a blotter, or else dissolve and measure strength by hydrometer tests.

The hydrometer measures densities of liquids, but it cannot distinguish impurities. A partly decomposed sulphite solution reading 60° simply indicates the density is the same as sulphite pure would be at 60°. The photographic hydrometer scale is an arbitrary one, which comes through from the old wet plate days when the instrument was known as an actinometer. Reading 60 means strength 60 degrees of silver nitrate per ounce, this hydrometer being direct reading for silver nitrate only.

The solubility of anhydrous sulphite varies little with change of temperature. With the crystals, the solubility shows marked changes. At 100° Fahr., 44 parts of sulphite are taken up by 100 parts of water, at 65° the ordinary room temperature, 25 parts by weight are dissolved. A hot solution is super-saturated, and on cooling to 65°, crystals are left in the bottom, with the 25 per cent. solution above. This solution of four parts water to one part of sulphite corresponds to three parts water to two parts of crystals.

Solubility and rate of solution must not be confused. Solubility is the amount which can ultimately be taken up at any given temperature. The rate of solution has to do with the physical condition, large crystals taking more time. The heat factor is of considerable importance, especially on sulphite. In the solution of crystals, heat is absorbed, so the solutions are chilled and warm water helps. With the anhydrous form, heat is released by the process of solution.

Sulphite goes into solution quite readily when water is the right temperature. It is much less soluble in boiling water than in warm water. With very hot water, it gets white and looks impure. If dissolved at about 90° Fahr., it will dissolve quite freely. This will surprise many people who have been annoyed by waiting for its quick solution by boiling the solutions.

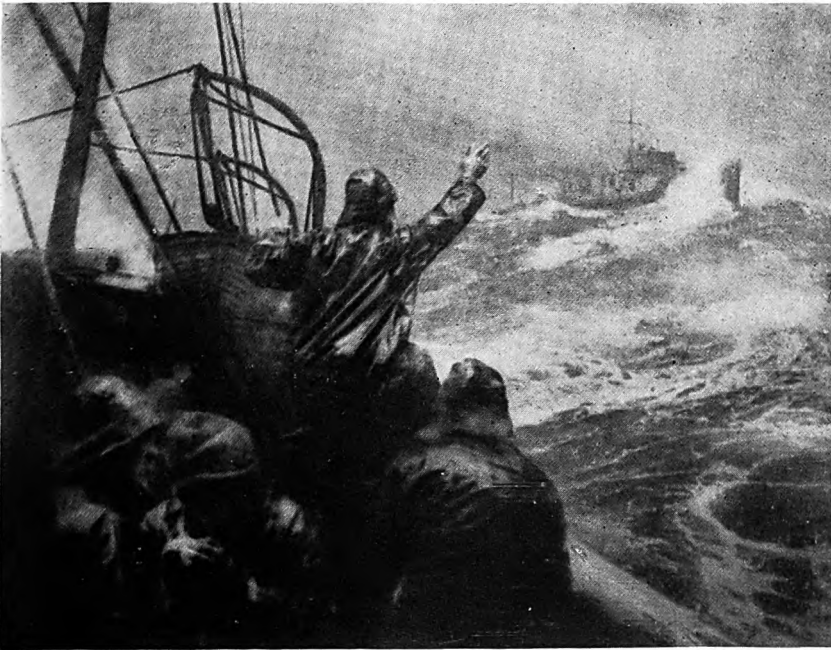
When dissolving, sulphite should be stirred into the water, otherwise the solution cakes over from the formation of a compound with water of crystallization and this in turn is harder to dissolve, because the water can only get at the top surface of the caked mass.

If required to keep the solution in cold weather, it will be found that a strong solution, which has been heated up to the boiling point, will not crystallize out as rapidly as one that has never been heated. The heat must not be applied until the solution is complete. Boiling it when crystals are present simply delays complete solution.

Stock solutions of sulphite of various strengths show interesting results as to durability. Five per cent. solutions drop to one per cent. in four days; ten per cent. to one-half per cent. in ten days; twenty per cent. to five per cent. in sixteen days. A twenty per cent. solution, made up with distilled water, which has been previously boiled to expel air, lost only one per cent. in ten days. Dry plate manufacturers lay emphasis on not making up solutions in quantities to last over one week.

The use of methyl alcohol in preserving developers is well known, and it is an essential part of some paper developers.

The best durability is therefore in concentrated solutions, diluting to strength as needed. By making up in small containers, with boiled water, each one sufficient for one batch of developer, we leave no free air in the bottles. This is the most practical method for those who do not use developer daily. It



"THE MINESWEEPER AND THE DESTROYER—'ALL'S WELL'"

F. J. MORTIMER, F.R.P.S.

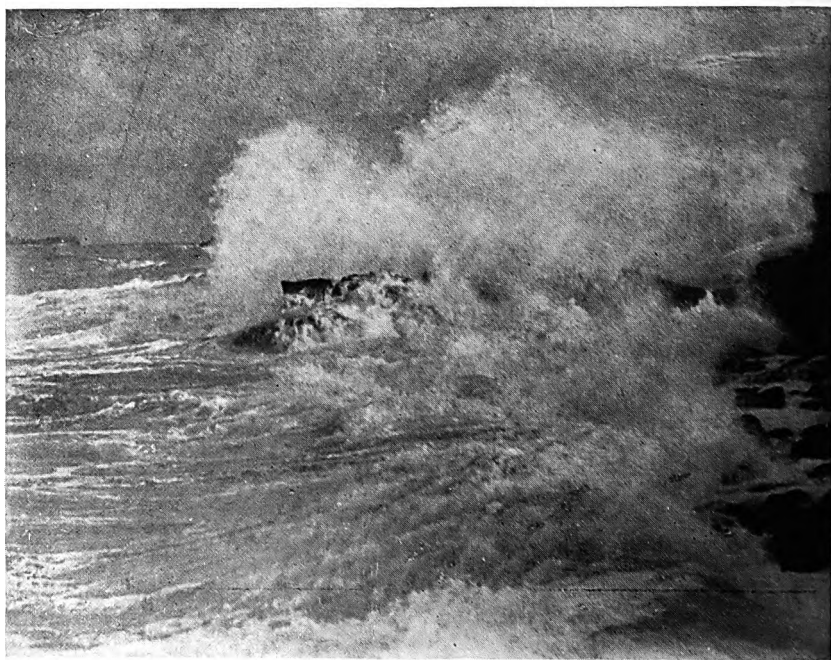
is found that sulphite and carbonate solutions keep just as well when mixed together, a very obvious convenience.

Mannite, one of the rarer sugars, has been suggested as a sulphite preserver—to preserve the preservative. While it reduces oxidation, it does not prevent it, and the cost is more than the sulphite value. A small amount of hydrochinone, a twentieth of one per cent., is much better. One part of this solution will stabilize one hundred parts 5 per cent. sulphite solution.

In place of sodium sulphite, the chemical known as potassium metabisulphite is sometimes met with in the formulæ. The formula, $K_2S_2O_5$, means that an extra molecule of SO_2 has united with K_2SO_3 , potassium neutral sulphite. The crystals also contain water of crystallization, making complete formula, $K_2S_2O_5 + H_2O$. Sodium metabisulphite is similar but the potassium salt is generally purer and more soluble. Metabisulphites are sometimes known as pyrosulphites.

Metabisulphite came in about 1886, while neutral sulphite dates from the pyro developing period and has been a constituent part of nearly every new developer as introduced. When sulphite oxidizes, the sulphate retards development, but with metabisulphite just the opposite occurs, for it can neutralize less alkali and allows developer to become more energetic.

Metabisulphite contains 57.7 per cent. of sulphur dioxide and has $2\frac{1}{4}$ times the preservative power of neutral sulphite. We can, therefore, use two-fifths as much, but we must neutralize its acidity with a little caustic alkali.



"THE COAST OF SCILLY"

F. J. MORTIMER, F.R.P.S.

For every twenty parts, use one part of potassium hydrate (caustic potash). In metol developers we must increase carbonate proportion a little. Every ten grains of metabisulphite needs thirteen grains of additional carbonate.

With amidol, when metabisulphite is substituted for sulphite in same proportions as for pyro, there is a deficiency in actual amount of sulphite in the developer. If instead of metabisulphite equal to one-fourth pyro quantity, we use one-half, the proportions are maintained. The developer works as well and keeps much better.

Metabisulphite solubility is 33 parts in 100 of cold water. Hot water must not be used, as it drives off sulphur dioxide. It should be in flattish crystals with only a little powdery deposit. Crystals have been kept for a year or two without material change, even in half filled bottles.

Solutions of metabisulphite above 20 per cent. are not as durable as sulphite, but influence of concentration of solution on their oxidizability by air is less important with metabisulphite and sodium bisulphite than with sulphite.

Sodium bisulphite, called for in certain processes like acid amidol development, is still another chemical substance. It is a transition body between the sulphurous acid and the neutral sulphite. The formula is HNaSO_3 and its solutions act like metabisulphite, but its strength is variable.

As the sodium only partly replaces the hydrogen in sulphurous acid, the chemist names it acid sodium sulphite. It gives an acid reaction to litmus paper. It corresponds to acid carbonate of soda, common cooking soda, HNaCO_3 , or saleratus, which bears the same relation to the neutral carbonate, Na_2CO_3 , or washing soda. Crystal bisulphite is unstable, and in its chemical reaction resembles metabisulphite. Oftentimes it is a mixture of metabisulphite and sulphate. It is soluble in 3.5 parts at 25°C ., and less in boiling water.

In acid amidol developers, acid sulphite lye is called for. This is usually a 40 per cent. solution of bisulphite and can be replaced by a 20 per cent. metabisulphite of soda or 24 per cent. of potassium salt. This latter strength cannot be made, so we use four times as much in 6 per cent. solution.

The organic bodies known as aldehyds and ketones add to the reducing power of developers in combination with sulphites. Acetone—a ketone—acts like the alkali of the developer and makes such alkalies unnecessary. By abolishing the alkali, we remove a cause of frilling and softening of plates. Formaldehyd is also similarly used in developers.

Preparations known as acetone sulphite and formosulphite have been on the market in the past. Acetone sulphite is an addition product of sulphite and acetone, while formosulphite is paraformaldehyd dissolved in sulphite solution. This solution replaces the alkalies and is a preventive of frilling like formaldehyd, the developer consisting simply of developing agent, formosulphite and water.

Sodium sulphide, occasionally confused with sulphite, is a simple compound, Na_2S . It is the chemical with the bad odor which makes the sepia color on prints after they have been bleached for redeveloping. The commercial article is very soluble in water, and while often impure, may be freed of iron

contamination by boiling, when the iron impurities become insoluble and precipitate out.

Ordinary hypo is popularly known as hyposulphite of soda. One method of preparing is to treat sodium sulphide with sulphur dioxide, sodium sulphite being produced. Further reactions go on between the sulphur and the sulphite and hypo results. This gives us a hint as to how to make hypo in an emergency when it may be unobtainable. We boil powdered sulphur with sulphite and use the filtered solution.

The crystals of hypo are $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$. It is really a derivative of thiosulphuric acid, and its true chemical name is sodium thiosulphate. The true hyposulphite in chemistry is Na_2SO_2 , an entirely different chemical, derived from hyposulphurous acid, H_2SO_2 .

Hypo is extremely soluble even in cold water, 100 parts in 100, but as it absorbs heat in dissolving, the solutions should be made with hot water and allowed to cool to room temperature. It dissolves undeveloped silver salts in plates and papers in the fixing operation.

The chemistry of fixing can easily be shown with a solution of silver nitrate and hypo in test tubes. Pour some hypo into the silver, and the precipitate formed turns black. Here we have excess of silver, like the conditions where hypo is too weak, or exhausted. When silver is poured into hypo, the fixer is in excess, as in a properly made bath. The precipitate formed almost instantly redissolves.

While the exact details of the reactions may be in doubt, it seems a fact that a double thiosulphate of silver and sodium is formed, which is very soluble in hypo solution. When the bath is working fresh, the solution is complete and the products easily washed out. If working near the danger line, the plate clears up, but it is very difficult to wash it free and as the transparent and insoluble silver salt is light sensitive, we have our explanation of stains.



"BRITANNIA'S REALM"

F. J. MORTIMER, F.R.P.S.

A moderately strong solution up to certain limits is quicker and better than a weak one, and an old one, loaded up with dissolved matter, is obviously not going to work quickly or surely. A bath with nine to ten ounces to a pint is as slow as one to two ounces to the pint. The best strength will average six or seven ounces to the pint. With hypo comparatively cheap, it is bad judgment to risk durability of results by false economy.

Sodium sulphite is also used as a constituent of acid fixing baths, and with sulphuric acid generates the sulphurous acid gas or sulphurous acid, which keeps the hypo from precipitating sulphur, the cause of stains in combination with the developer carried over into fixer. Rinsing between developer and fixer relieves the fixer of some of its work.

Acids precipitate sulphur from hypo, but as we noted previously, sulphur plus sulphite makes hypo and when properly made, the sulphur does not precipitate. Alum is sometimes added to acid fixers to harden gelatin which has softened up by the developing alkalies. The alum must not be added till hypo is entirely dissolved and mixed thoroughly with the sulphite, and a precipitate will form if sulphite is spoiled or contains a lot of sulphate.

Ammonium hyposulphite has been recommended as a substitute for the sodium salt. The rate of fixing is accelerated, and similar results can be obtained when ammonium chloride or sulphate is added to ordinary fixing baths. It is not believed that such methods present any real advantages. What we need in photography is not a new hyposulphite fixer, but a new agent, free from sulphur, so that we may get rid of sulphur troubles forever.

THE LATENT IMAGE

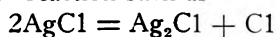
THE power of light to produce changes in the natural chemical compounds has been known for many years. Glauber, in the seventeenth century, knew that organic substances, such as paper and leather, would blacken if impregnated with silver nitrate and exposed to light. It was not, however, until the early part of the nineteenth century that the principle was applied successfully to picture making, and since that time many investigators have been busy with researches that have brought photography up to level of both an art and a science. The materials used in the general run of photographic procedures are not very numerous, and represent but few distinct classes of compounds. The sensitive emulsion is usually a silver salt, the developers are comparatively simple reducing agents, and the fixing material is now scarcely ever anything but hypo.

Notwithstanding the somewhat narrow field that photography offers for investigation of the chemist and physicist, some of the problems are still not satisfactorily solved, and among these is the question of the latent image. At the outset of an inquiry in this field, we may appropriately inquire as what is meant by the expression, and the more thought we give to the problem the more it seems to evade us. The latent image is the image that is not seen by the human eye, but which the fact of development shows to be on the plate. As a matter of

fact, there are many phenomena in nature that are invisible. It is now known to all who are interested in photography that a large part of the light emitted by the sun is wholly invisible to human eyes, and that these rays are found at both ends of the spectrum, being termed, respectively, the ultra-violet and infra-red. Within the limits of the ultra-violet are the X-rays and those emitted by radium, and within the limits of the infra-red are the rays that are employed in wireless telegraphy, and it is well known that all these rays are invisible to the human eye.

Many of these rays are, however, active on common photographic emulsions, and hence a great variety of pictures can be produced in apparent darkness. It seems, therefore, reasonable to assume that the latent image is only latent because of our limited vision. It may, indeed, be of the nature of a visible image, but so slight under ordinary circumstances as to escape notice. If we are dealing with silver chloride, instead of the ordinary bromide or iodide, the image is quickly apparent, as is shown by the common printing-out paper. Suppose, for instance, that such paper is exposed for a very short time, a fraction of a second, to light. There seems to be no reason to doubt that some impression will be made on it, though careful examination will show no change. It is not likely that scientific photographers would agree that this paper contains a latent image, for that term is usually limited to actions that do not become evident until developed, but this may be a distinction without a difference.

Much speculation has been bestowed on the question as to what happens when ordinary emulsions are subjected to the action of light. It was for a long time supposed that a portion of the silver compound is decomposed, the generally accepted view being that a so-called sub-compound is formed. For instance, when silver chloride is affected by light it darkens rather promptly, and the explanation was that a limited amount of silver sub-chloride is produced, which was much darker than the original material. It was never possible to isolate this compound or to determine its exact composition. It was merely assumed to exist. It is true that careful tests often show that minute amounts of chlorine, bromine or iodine are set free by the action of light on their silver salts, but this does not prove the formation of sub-salt, for the liberated element may be due to a complete decomposition of a minute amount of the compound. It is impossible to say from what particular molecule the element may come. According to accepted theories, the common sensitive salts of silver, called for brief the halides, contain only one atom of silver and one atom of the other element in each molecule. A reaction such as

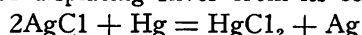


is theoretical.

In considering this matter, it must not be overlooked that other influences than that of light may bring about an effect on an ordinary emulsion. The following experiment will illustrate this. A piece of light-proof paper—the red-black paper used for daylight films answers very well—has a portion cut out and is then placed against the emulsion of an ordinary slow plate. It is most striking to cut out some letter of the alphabet, say M. The combination

is then laid upon a flat plate of zinc, magnesium or aluminum, so that the emulsion is turned toward the metal, but does not touch it. Amalgamated zinc is especially active. A piece of old battery zinc, scraped clean, is suitable. The arrangements are, of course, all made in the dark, and the plates are left for several days, or better, a week, in a dark box. On removing and examining the emulsion by the safe-light, no impression is seen, but any ordinary developer will bring out an image of the design cut in the paper. Here there seems to be a direct impression of the *vapor* of the metal upon the emulsion, for it is found that the more volatile metals are the most active. Very little, if any, result can be obtained with iron, silver or gold.

These actions are probably due to the direct chemical action of the vapors of the metal on the salts of the emulsion. The really active metals are those which have the power of displacing silver from its compounds. The reaction



is a familiar one in the laboratory, and the metals zinc and magnesium can act in the same way. Gold and platinum do not produce the change. Iron has a similar chemical action to zinc, but the failure of iron to produce any picture may be due to the extremely small amount of vapor that it emits.

Zsigmondy, in his recently published third edition of "Colloid Chemistry," devotes several pages to the discussion of the physical chemistry of the latent image, and dismisses as untenable the theory that sub-salts are formed. He holds that the action of the light is to decompose completely a minute amount of the silver salt, leaving the free silver included in the mass of unchanged salt. It seems undeniable that such an alteration of composition of the emulsion will alter its electrical relations and, therefore, when the reducing action of the developer takes place, the distribution of deposit will be determined by the differences in electrical condition of the surface. The light struck portions attract the separating silver, while those not light struck do not attract it. It may be said that the developer does not carry in solution any silver salt, but scarcely any compound is wholly insoluble in such solution, and only a very small amount of silver salt is required to start the action.

Another problem of the latent image arises in connection with the procedure of developing after fixing. This must be confused with the combined developing-fixing, which is now so much in evidence in the journals. In the former procedure, the plate after good exposure is plunged at once into a somewhat dilute hypo (5 per cent.) and allowed to remain until all traces of the silver salt have disappeared. The plate, which is then perfectly clear, is thoroughly washed, and then immersed in a solution containing a developer (*e. g.*, metol), a sulphite and a mercury salt. In a few minutes the high-lights begin to appear, and in the course of thirty minutes to an hour the details of the picture are complete. The development may be conducted in full daylight. The question is, where is the latent image? It would seem that it is in the gelatin. It may be said that the small amount of free silver which has been formed by the action of the light, according to Zsigmondy's theory, has been left undissolved by the hypo, that it is this that determines the development of the picture. It

is, however, well known to those who are familiar with the wet process, that glass plates that have not been thoroughly cleaned may cause a development of more or less distinct impressions of the former image.

The subject is yet in much obscurity, and after all we may well question whether the expression latent image is more than a mere term. The shortest impression of light upon a sensitive material probably produces a distinct change, and the fact that we cannot see it is merely the result of our limited vision.

Another phase of the problem comes up when we attempt to account for the curious results that Professor Nipher obtained some years ago, by very prolonged exposure of plates, by which positives are obtained, and with which development must be conducted in the light or fog will result. For a brief notice of these experiments, see the PHOTOGRAPHIC JOURNAL OF AMERICA for April, 1921, page 158.

COLOR PHOTOGRAPHY AND ART

PHOTOGRAPHY is essentially a reproductive art, and as such, when judged for its pictorial worth, dares not be too disregardful of technical rendition. Ability, however, for accuracy of delineation of natural things cannot be placed to the credit of the artist who uses photography as a means of expression, because it is dependent upon mere mechanical execution, a knowledge in manipulating the lens and timing exposure.

Now, as concerns the relation of photography in natural colors to painter's art, we photographers who affect to be exponents of the art phase have no more right to plume ourselves with having endowment of ability to faithfully translate nature's tints by these mechanical contrivances, furnished to hand, than we have to take credit to ourselves for skill in rendition by the lens of nature's details, which alone does the work of the accomplished draughtsman.

The analogy of the pictorial photograph to the painting seems to be in relation to miniature work, or perhaps to paintings of the "pre-Raphaelite Brotherhood," whose work is characterized by faithful adherence to reality.

While appreciating this movement, inaugurated half a century ago by Hunt Rossetti Maddox-Brown and Tadema and indorsing the fidelity to nature they insisted upon, it is evident that they carried their hobby to too great extremes, and so produced a revulsion of taste. Still they did do much for art, chiefly by stimulating interest for impressionism.

In a word, one might venture to say that pre-Raphaelism in art was tried and found wanting, and so may we not look on the methods of color photography, as far as art is concerned, as something too radical, deflecting too materially from the legitimate fundamental principles of color rendition in the way of the painter.

Still, like pre-Raphael art, color photography may be instrumental in directing the painter to a broader and more intimate view of the philosophy of color; but as exploited at present, it is too crude and mechanical, so even more objectionable artistically than excessive display of detail.

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J. F. Gabriel Lippmann

J. F. Gabriel Lippmann, the inventor of the interference method of color photography, died on July 13th last after a brief illness. He was born in 1845, being of Alsace-Lorraine parentage. He began soon after the close of his school life to carry out researches in physics, devoting special attention at first to electricity. His thesis for the degree of Doctor of Science was on electro-capillarity. His progress in acquiring scientific honors was rapid. In 1886 he was elected a member of the Academy of Sciences, and later numerous other appointments of trust and duty were given him. In 1918 he was awarded a Nobel prize in physics.

The invention by which he is best known was presented to the Academy of Sciences on February 2, 1891, demonstrated by a photograph of a spectrum of such vividness and accuracy that those who were not aware of the manner in which the picture had been obtained were inclined to suspect a trick, but later demonstrations confirmed the reality of the method. The procedure was the result of careful scientific investigation and based on definite optical principles. Lippmann did not escape criticism and even condemnation by penny-a-liners, but the leading photographic societies quickly perceived the merit of the invention. In 1892 the French Photographic Society awarded him the Jannsen medal, and in 1897 he received the "Progress" medal from the Royal Society. Lippmann continued his interest in photography during the rest of his life, and published from time to time contributions in the field, among which was one in 1889 on the employment of color

screens in orthochromatic work, especially relating to the method of triple exposure with blue, green and red. In 1906 he published some researches on a prismatic method of color photography, which he thought was novel, but at that time an English patent of some years standing had indicated some of the main features of this procedure.

It appears that important data of further researches exist among his manuscripts, and it is hoped that his most intimate collaborator, C. de Wattville, will arrange for an early publication of these.

THE LIPPMANN PROCESS OF COLOR PHOTOGRAPHY

The first account of this process appeared in *Comptes rendus*, 1891, 112, 274. A recent issue of *La Revue Française de Photographie* gives an abstract of this paper. The procedure depends on the action of a film of mercury pressed against the sensitive surface of a plate. Lippmann states that it is necessary that the silver salt (bromide) shall be essentially structureless, under which circumstances it is practically transparent. The colors are produced by interferences similar to those which occur in soap bubbles. The plates when viewed by transmitted light are reversed; that is, the colors are complimentary, in this respect resembling the colors of the autochrome after the first development. Lippmann gives methods of obtaining the correct condition. The description in the original publication is very brief, and without any drawings of apparatus or specific explanation of the optical principles, but the article in *La Revue Française* is illustrated with drawings and accompanied by a portrait of the scientist in his laboratory. The process has not come into commercial use. It was not patented.

Activity of Some Developers

Some developers are apparently more active than others.

We are told that the process of development is really a continuation of the light's action in exposure. That is, it dissociates the rest of the haloid components, thereby precipitating a correspondent quantity of the silver in a metallic state.

We are further informed that if the action of the developer corresponded with a prolongation of light activity an ordinary dry plate ought to blacken in light just as intensely as it does in the developer, which, as you know, is not the case. The reduc-

tion of light taking place under different conditions from that in the developer, and particularly the appearance of oxidation, plays here an important part.

If a plate be exposed to light for a longer time than is necessary for a developable image, oxidation takes place and the silver bromide darkens in the developer just as slightly as it does in direct light, with a very long exposure.

We get identical results upon chloride of silver paper by short exposure and subsequent development, as well as by simple prolonged exposure to direct light.

The development is therefore analogous to prolonged light action; of essential influence is, therefore, the nature of the silver halide.

The greater the quantity of silver, with so much less facility does oxidation take place, and so much more can the development be replaced by a correspondent prolonged exposure, and a reversal, also chloride of silver, with nitrate in excess, furnishes a strong image (free silver) by light action alone (printing out), but also with a dilute developer and short exposure. White iodide of silver, with excess of potassium iodide, shows no change.

The developing strength of any developer depends, therefore, very much upon the energy with which the same absorbs bromine, chlorine and iodine.

The different reagents vary much in this respect.

Amidol, paramidophenol and eikonogen show good developing properties with sodium sulphite alone, while some others demand a strong alkali.

Use of Bromide

There seems to be no constant factor made use of in the employment of potassium bromide in amateur negative making.

Those who engage in the making of prints from amateur negatives report that the average character of the negatives submitted is of such a quality that passable results can only be had by use of gaslight papers—contact printing being out of question.

The chief defect is flatness of image, due no doubt to the penchant of using the most rapid brand of plate without sufficient knowledge of the way to develop such a plate.

The general practice of the amateur is to disregard altogether the use of bromide of potassium. He takes his cue probably

from the pronouncement of the skilled pictorialist who expresses distrust of this agent (and with justice) when soft effect is aimed for. But the skilled worker knows the necessity of correct exposure, and, with proper timing, it is unnecessary, and besides may be detrimental. But the amateur, as said, is prone to over-time and even a slight over-exposure in development, if bromide is omitted, invariably leads to a foggy result.

If the development is curtailed to avoid this fog, a thin, flat negative results, while, if the development is continued to get density, an unprintable foggy negative is obtained.

Everyone nowadays must have quick plates and quick lenses, with prevalent over-timing, whereas in earlier days the tendency was in the direction of brief exposure, with resultant hard negatives.

Perhaps the prevalence of fogged negatives may be primarily traced to the predilection of the amateur for tank development with unrestrained diluted solution.

Bromide is essential when the time of development is prolonged, but many presume that the dilution of the developer precludes the use of bromide, and so it is discarded even when recommended in the formula. Clearing baths are not much in use, but they are often needed to clear up slight fog. A weak Farmer's Reducer applied to the affected plate immediately after fixation (before it is washed) produces marked improvement.

Ultra-Violet Radiation and the Eye

It has been recognized for some time that, unless protected by a glass globe, the radiation from a quartz mercury arc or from an iron arc or from any light source emitting large quantities of ultra-violet rays is harmful to the eye. In a general way, it has been assumed that all radiation of shorter wave-lengths than 350 *mμ*, is injurious to living tissues. An organ (*e. g.*, the eye) is composed of tissues—connective tissue, nervous tissue, etc. The tissues are composed of cells. Ultra-violet radiation kills living cells and tissues by changing the protoplasm of the cells in such a way that certain salts can combine with the protoplasm to form an insoluble compound or coagulum.

Cataract is an opacity of the crystalline lens. Many observers have demonstrated that it is impossible to produce an opacity of the lens or cataract in a normal living animal by exposure of its eye to ultra-

violet radiation. Analyses of human cataractous lenses from America show a great increase in the salts of calcium and magnesium, and those from India show, in addition to these salts, silicates. Glass blowers who develop cataract form a relatively small proportion of those engaged in that occupation, and it is assumed that those who do develop it have a disturbed condition of nutrition, which expresses itself in an increase of those substances which can precipitate the portion of the lens acted upon by ultra-violet radiation.

An opacity of the lens or cataract can be produced in fish living in solutions of those salts, found to be greatly increased in human cataractous lenses, by exposing the eye of the fish to ultra-violet radiation. This cannot be done with fish living in tap-water.

Aero-Photographs of Estates

There recently appeared an advertisement of the sale of an estate, in which features of the property are admirably shown by two aerial photographs taken by the Aero-photo Company. According to the *London Times*, this is the first occasion on which photographs taken from the air have been employed for such a purpose, and emphasis is very properly laid upon the advantages which they possess. The aerial method is able to achieve with certainty, and under any topographical conditions, which has been occasionally possible when a distant viewpoint on ground at a higher level has permitted. But the cases in which an estate is so situated at the bottom of a basin, on the sides of which the telephotographer may erect his camera at any point of the compass, are few and far between, and even under the most favorable of such conditions one can never expect to show the plan and surroundings of a country mansion in so satisfactory a manner as that which is illustrated in the two aerial photographs to which we are referring. One has only to compare these latter with the eight photographs taken on the ground, which are reproduced on the same page of the *Times*, in order to perceive at a glance the superiority of the aerial method. While that superiority is marked particularly by the showing of the relation of the house to the immediate surrounding country, the architectural design of the building receives at least as adequate a representation as it would in a photograph taken from a relatively near standpoint on the level.—*Harrington's*.

Value of Good Grouping

The advantages of good grouping of the parts of a picture (decorative value), are more pronounced and hence more important in a photograph, to make it produce effect, than in a painting, for the reason that in the painting a brilliant and harmonious effect in the coloring may atone for its shortcomings in other directions.

How many a superb conception in color by the impressionist makes invisible the execrable drawing, or mollifies the obnoxious motive.

Translate such a picture in terms of black and white, and we would say "take away the picture."

And so in the photograph, where we are restricted to monochrome, we must have every supplementary effect, to make the result something more than a piece of mere mechanical work.

Anticipation of Lippmann Method of Color Photography

The recovery of the first correspondence shows that as early as 1829, more than ten years before the publication of Daguerre's method of photography, that Niecephore Niepce, Daguerre's partner, was very close to the direct heliochrome method of interference, now called the Lippman process.

The document setting forth his results was published by the French Government about the same date of Daguerre's process. Niepce exposed silvered glass and metal plates coated with a thin film of bitumen.

He speaks about a landscape made on such a plate, remarking, "If this picture be viewed by reflection in a mirror on the coated side and at a certain angle, the effect is most striking. Viewed by transmitted light, we have only a confused and shapeless imagery; but what is surprising in this position, the mimic tracery seems to affect the local colors of certain objects. I have thought that the effect might be caused by the same principle which causes the colored fringes shown first by Newton due to interference. The results appear to me to warrant new researches and to merit more profound inquiry."

The greatest advance, however, was made by M. Edward Becquerel. His first memoir on the subject was published in 1848 and presented to the Academy of Science at Paris. In a work first published in 1868, he summarizes all his previous work giving credit to his predecessors, with the excep-

tion of Seebeck, of whose investigations he seems to have been ignorant. He speaks of the difference of results obtained with chloride of silver by double decomposition and of chloride previously exposed to diffuse daylight. The film of the latter giving a very appreciable amount of color rendition while the former gave none whatever. Afterwards, he tried chloride of silver produced by direct action of chlorine upon a silvered plate. On exposing a plate of silver to chlorine gas it becomes grayish white, and on projecting the spectrum thereon we get only grayish tones, the effect being deepest in the violet part. But if the film of silver is attacked by chlorine given off by chlorine water, the action is very different. If the spectrum be projected upon a plate so chlorinized for several minutes and then examined by diffused light, we obtain an image of the spectrum in colors. The red is represented by pale red and the yellow by yellow, the blue by blue and so on.

He next tried solutions of various chlorides; iron perchloride, copper chlorides and the hyper chlorites, and other solutions yielding chlorine. He thus obtained images of the spectrum in true colors, which were exhibited in 1848.

Getting an Idea

The photographer who is fortunate in having an idea will generally find some way of expressing that idea. The better the idea, the more likely is he to express it in terms photographic, instead of camouflaging someone's else idea in art elaboration. We note that such a man is capable of stamping his individuality upon his work. The style is the man after all, and each artistic photographer's manner of doing things graphically varies, and is distinct from the work of others.

But doubtless many of us wander about blind to the beauty which the artist who knows what beauty is appropriates.

It is only the genius who looks at Nature and gets a revelation. Most of us never see Nature aright until we first look at her through the spectacles of art.

But let us be satisfied that our eyes can be trained to appreciation by education. Let us make use of art to open our eyes to contemplation.

Selection and combination are the principals with which expression works; and taste, feeling and individuality may be stimulated by a study of the principles of art.

Definition in Portraiture

Perhaps the most insurmountable obstacle which is encountered by those endeavoring to produce by photography works having the quality of art is that which relates to definition. The difficulty appears the greater from the fact that, as a result of optical conditions, the definition of a photographic portrait is localized in the parts of the subject which are in exact focus, whilst other parts are rendered more or less "woolly" in appearance; part of the outline is obtained quite sharp against the background, whilst the rest suffers from diffusion or fuzziness.

Most of those who have studied this question of definition in relation to portraiture have taken the view that it is due only to the greater defining powers of the lens, as compared with that of our eyes, and have, therefore, sought to break up this sharpness in order to obtain a more exact reproduction of nature. Claudet, in 1866, suggested altering the focal length of a lens during the time of exposure by separating the front and rear components. He aimed at reducing the excessive sharpness of some parts, and the too great fuzziness of others, by bringing them all into the plane of sharp focus. In the same year Dallmeyer introduced his famous soft-focus lens, a modification of the Petzval objective, in which he obtained an analogous result more easily than Claudet by slightly unscreening the rear lens before exposure. Much later, in 1904, MM. Puyo and de la Pulligny introduced their artistic lenses, yielding diffusion by residues of chromatic aberration, and soon afterwards there appeared the Eidoscope of Hermagis, in which diffusion resulted from spherical aberration; the Dallmeyer-Bergheim, etc. [M. Cromer is in error respecting the date of introduction of the last named, which was about 1895.—Eds., "B. J."] In the hands of many skillful portrait photographers these lenses have produced remarkable results; but, in my opinion, they serve only to hide, by their diffusion, the definition which is the ideal of the artistic photographer.

Shortly before 1900 M. Boissonnas, of Geneva, following suggestions of the painter Darier, made a start on what, I think, is the correct path by studying what he termed binocular photography. We do not know what was Darier's idea; but it is easy to imagine it by recalling Wheatstone's demonstration of double vision. Since the draughtsman looks at his model with both

eyes, he sees a little more of the left side of his model with his right eye, and a little more of the right side with his left eye. His drawing is thus the synthesis of these two aspects seen simultaneously. The lens, however, sees over a single angle, and views Nature as a one-eyed man would do. In order to imitate the unconscious process of the draughtsman by photography, Boissonnas employed on his camera two lenses, paired as for stereoscopic photography. By slightly inclining the lenses, he caused the two images to be superimposed on the ground-glass. In this way he produced the curious portraits exhibited by him in Paris in 1900. But the process had two defects. In the first place, the superimposition of the two images was a delicate operation, and in taking a portrait it is necessary to work quickly to avoid fatiguing the sitter.

Moreover, it is well known that the exact registration of two images of the same subject taken with two lenses under different angles cannot be done. In the process of Boissonnas, the two lenses were mounted horizontally, and, therefore, the images could be registered as regards their height, but not as regards their width. Thus the outlines approximating to the vertical were sharply doubled, enlarging the image obtained, and though nearly horizontal lines were almost sharp, those running nearly vertical were never so.

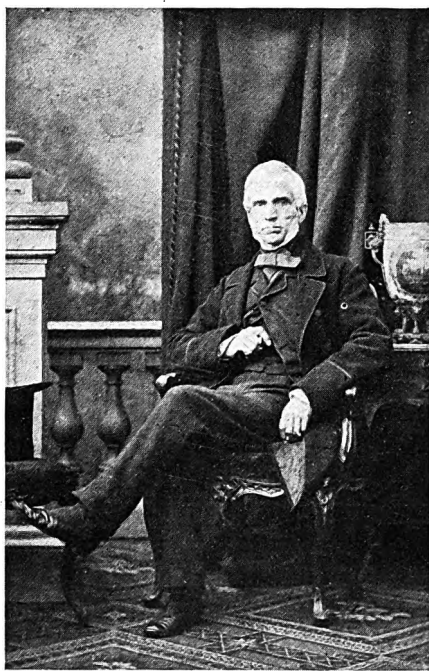
I have endeavored to find a solution of this problem which has occupied experimenters since Claudet; and I first noticed that the works of artists, draughtsmen and engravers, as well as painters, of every period of school, with rare exceptions, never employ diffused definition in the rendering of Nature. Their work may be done in masses or broad effects obtained by reducing or omitting disturbing details, but the drawing and the essential outlines are always firmly defined. In short, whatever the kind of representation, artists reproduce what they see within limits comparable to those of normal human vision in the examination of a scene.

On the other hand, the fertile idea of Darier, supplemented by the experiments of Boissonnas, gives the key to this habit among artists to those photographers who are seeking to infuse art into the works produced with a lens. The latter does not record as do our two eyes; but, as a one-eyed person. I venture to think that in this lies the true explanation of the definition produced in photographs.

The direction in which to experiment was

thus plainly indicated. *We require a lens able, first, to see binocularly; and, second, to define the image within the limits of precision of a normal eye.*

An observation of Brewster's pointed me quickly to the solution of the problem so far as binocular vision is concerned. The English physicist noticed that lenses of too large diameter introduce into the photograph parts of the subject which, with our two eyes, we see only by alternately turning the head to the left and the right. It, therefore, seemed probable that lenses of suitable diameter would see the sitter as we do.



ANTOINE FRANCOIS JEAN CLAUDET
DIED 1867

Practice showed the correctness of this assumption, and that the best rendering in this respect is obtained with lens of 5 inches or about 13.5 cm. diameter. Those of 4 inches diameter are large enough for this purpose, but those of 6 inches are too large, and, moreover, are of inconveniently great focal length. My experiments were made with a lens of 5 inches diameter of aperture.

As a control of the first results, I made an experiment for the purpose of proving that a lens of this size views the subject from different angles, as do the two lenses

of a stereoscopic camera. Choosing an immobile subject, a plaster bust, I took a negative after having placed behind the front lens a piece of black card having a circular aperture of 3.25 cm. diameter, which was disposed tangentially at the right-hand edge of the lens. Focusing was done on the eyes, before placing this mask in position, with the lens at full aperture. This first negative was made on the left-hand half of the plate by means of the customary repeating back.

I next made a second negative under the same conditions, except that the mask was turned to bring the aperture tangentially at the left-hand edge of the lens, and the exposure made on the right-hand half of the same plate by sliding over the repeating back. A pair of negatives was thus obtained on the one plate representing the two views of the subject. If, now, the lens sees binocularly, we should have, on making positive prints and mounting them at a separation of 6.5 cm. between corresponding points, a stereoscopic print, exhibiting the customary relief. The result conclusively showed this to be the case; and it can, therefore, be admitted that a lens of 5 inches diameter of aperture renders modeling as seen by the eyes.

But, as regards sharpness of definition, the problem still remains to be solved. With this lens the definition of parts of the image in sharp focus was too good, but of others, insufficient. As regards this question, I had noticed that with portrait lenses, particularly those of old construction, the margin is far from being equivalent in effect to the central part, and the sharpness of the image comes chiefly from the midway region of the lens. By masking this portion more or less completely by a disc of black card placed at the center of the front lens, we ought to obtain less perfect images, and therefore more nearly in correspondence with those seen by the eyes. This was the first means tried for the production of the desired normal rendering.

It should be noted that the use of a disc in this way does not involve appreciable increase of the time of exposure. If an objective of old type is used, such a disc covers scarcely a quarter of the surface which can be utilized at full aperture; and if it is borne in mind that, without the disc, it is necessary to stop down for the sake of depth of focus, it will be understood that the use of the disc does not reduce the useful speed of the lens. The disc used against the front lens can be replaced by

one of suitable diameter central in the position of the diaphragm.

An alternative means for remedying the excess of sharpness can be used, and has the advantages of leaving the speed of the lens unaffected, and of not requiring a lens of old type. Moreover, it can be very readily modified according to the degree of diffusion desired or admitted. The second method consists in interposing in the path of the image-forming rays a transparent screen, so as to alter the course of the rays slightly. The clear gelatine sheets used by photo-engravers answers excellently, if of the utmost purity. I employ them from 15/100 to 30/100 thickness, equivalent to .006 to .012 of an inch. The thinner the screen, of course, the less the diffusion.

Some experiment has been devoted to finding the best position for such a screen. I have tried using it in the plane of the diaphragm between the two glasses of the back combination, and lastly behind the whole lens at distances ranging from .1 to 20 cm. from the back combination. Of these various positions, the worst seems to be that in the plane of the diaphragm for the screen then tends to grey the image. The position behind the lens appears to be the best. In this position the screen produces the minimum of greying, and gives less diffusion as it is moved away from the lens in the direction of the plate, the latitude in this respect being an important advantage.

For the mounting of the screen, a collar may be secured round the rear part of the lens tube, and serves to support a horizontal rod parallel to the optical axis, placed below this axis and extending in the direction of the plate. The screen is mounted on a light cardboard frame, to which is fixed midway at the top perpendicularly to its surface a tube which slides stiffly on the rod. Thus we have only to remove the ground-glass from the camera in order to fix the screen on the rod and can move it along the latter as required. Also, the screen can be readily exchanged for a thinner or thicker one. I would add that the gelatine screen can be used with any lens, and will be found a novel and practical means of securing diffusion without the aid of special fittings. All that is necessary is to fit the screen to the camera in the same manner as a light-filter, preferably behind the lens. In place of the gelatine screen one of extra thin glass, such as a microscopic cover glass, can be used. The perfect transparency of

glass avoids all trace of greying effect on the negatives.

The use of this somewhat thicker screen serves to show the way in which the process improves the even character of the image. This image appears on the ground-glass as formed of several images, which do not coincide, or only very approximately, in the parts which are in sharp focus. The excessively sharp focus of these parts is thus modified. In the parts which are not in focus these various images are slightly separated, and the outlines, instead of being unpleasantly woolly as usual, are formed by a certain number of fairly sharp and adjacent lines, which impart a much firmer character to the definition, in the manner of the pencil strokes of the draughtsman. It can be said that a positive increase of depth of focus is produced in this way.

I will now refer to a third means which I have studied for overcoming the excessive sharpness given by portrait lenses. It is, however, applicable only to lenses of the old types of relatively small aperture.

Proceeding from the observation that these lenses can be opened out whilst still giving sufficient depth of field for portraiture, I enlarged the fixed diaphragm and obtained images of much more even definition.

In reference to the use of large lenses, it is often stated that if of greater diameter (of diaphragm) than 10 cm., they produce deformation of the image by recording parts of the subject, which the two eyes cannot see simultaneously. (M. Cromer here projected a portrait in illustration of the incorrectness of this statement.) The result I now show you was made with a lens of 5 inches diameter (= 13.3 cm.), the same one used in making the stereoscopic pair of negatives previously mentioned. Now, just as it has been shown in the stereoscope that the relief obtained by the use of this lens was not exaggerated, but was, if anything, less than the regular stereoscopic relief, so in the single portrait we notice how small is the difference of viewpoint in the two images. In this experiment the camera was 13 feet (4 m.) from the subject. If we take up a position at the same distance from any sitter, and close first one eye and then the other, we shall not perceive less of the right side of the model with our left eye and of the left side with our right eye than is recorded by our 5-inch (diameter) lens when employing the right-hand and left-hand portions of its front glass. Therefore, I repeat that lenses of 4 inches, and

particularly 5 inches, diameter are solely capable of seeing binocularly without deformation, and that it is not until lenses of 6 inches diameter are used that there is occasion to fear the defective drawing which is commonly attributed to lens of diameter greater than 10 cm. In illustration of this I show some examples made with a lens of 5 inches diameter, in which the sharp definition has been reduced by one of the means described above. (M. Cromer also showed two examples made in the same manner by M. Benjamin, the well-known Parisian photographer.)

To conclude, when it is wished to obtain the most realistic and striking portraits, we must have recourse to lenses of sufficiently large diameter, as was done by Adam Solomon, Nadar, Carjat, Bertall, whose most beautiful work challenges comparison with much of recent date. Such lenses should be free from chromatic aberration, and employed in conjunction with one or other of the screens described. In this way the extreme sharpness of definition will be broken up and the quality of binocular vision will be utilized.—G. Cromer in the *British Journal of Photography*.

Color Photography

By H. S. WATKINS

The representation of objects in their natural colors has been one of the aims of mankind at all periods of the world's history, and has been practiced with varying degrees of success from the days when the cave man tinted crude sketches on the walls of his dwelling, until the present day, when we have reached the stage at which the most accurate reproduction is within the reach of every one with a reasonable working knowledge of photography.

Any explanation of the principles of color photography requires some preliminary explanation of the theory of color itself, and for a start we learn that colored bodies, as we understand them, have no color at all.

The impression of color is produced by the action of materials and substances upon light, so that all color is dependent upon light, without which there can be no color. For this reason the actual color of objects is subject to considerable variation according to the composition and quality of the light by which they are viewed. To understand how light produces color, a proper appreciation of the composition of light is necessary, for light is not a simple substance, but is composed of a number of colored rays. Fre-

quently when a neutral tinted fabric is unravelled it is found to contain threads of many different colors, and in much the same way a beam of light when decomposed or unravelled is found to be composed of violet, blue, green, yellow, orange, and red rays in varying proportions. Of these blue, green, and red are the most important as regards color photography, as they correspond with the color sensation nerves of the eye, and are alone capable of producing all the colors in nature. To these must be added yellow, which is of great importance in printing processes, as will be seen later. Beyond the visible violet rays are those known as ultra-violet, which have the greatest chemical activity, and it is to check the activity of these and bring them into line with the green and red rays that a yellow filter is so necessary in screen plate color work, as without this a blue fog results.

It is imperative here to differentiate between the action of mixed pigments and mixed lights, as the results are not comparable. In the former case mixing increases the suppression or absorption of rays with each pigment used, whereas the mixing of lights adds light to light. When a beam of light falls upon a colored object, certain rays are absorbed and the remainder reflected. Take, for example, the tri-colored flag: the three rays, blue, green, and red fall upon the red section, but the blue and green are absorbed, only the red being reflected to the eye, causing that portion of the flag to appear red. The same action occurs in the blue portion, only it is the green and red that are absorbed, but in the central portion all three rays are reflected, and as the three combined formed the original beam of white light, the central portion appears white. We should therefore say that the first section was red, although it is only endowed with the property of reflecting red, and if there is no red to reflect it will not appear red any longer. As a matter of fact, were this flag viewed by the mercury vapor lamp this portion would appear black although in a brilliant light, because this light is practically without any red rays to be reflected, and as the material is only capable of reflecting red, all the rays received would be absorbed. In the case of mixed lights, when the three rays are obstructed by what is usually called blue glass (really red and green absorbing), the green and red are absorbed and only the blue transmitted, and similarly with the other two colors, so that from the white sunlight we obtain three beams of different colors by subtraction, and

if the blue, green, and red beams so produced are arranged to register upon a suitable surface, the resultant will be white by addition. The three rays, blue, green, and red together produce white, and any one of them when mixed in the proper proportion with one other color is also capable of producing white, the second color being called the complementary. The complementary pairs are:

Blue—yellow Green—pink or red
Red—greenish blue or green

When blue, green, red, and yellow are referred to, these names are used in a general sense, as no two authorities name these colors alike, but wander about among rose red, orange red, blue green, blue violet, violet, and greenish yellow, etc., as the actual hues are very subtle and vary considerably under different circumstances, but for the purpose of this brief survey they are used in a general sense as referring to the blue, green, and red families and their various cousins.

It is sometimes helpful to consider the theory of light with that of sound, as the analogy is very close in many respects, as both owe their origin to similar causes, *i. e.*, vibrations or undulations. Just as a certain number of vibrations per second produce a certain note, so do a definite number of vibrations per second produce a specific color, and as two or three sets of sound waves together give a chord, so do two or three sets of light waves together give a color chord. This analogy may help to make clear the difference between the production of color by light and pigments. Color production by light is similar to starting with three silent tuning forks which are set in vibration one by one, each adding its note to the others, until the final chord is obtained by addition. To be equivalent to the pigment theory you must assume the three forks in full vibration giving the complete chord, the combined note of any two, or the single note of any one being obtained by damping down the vibrations of the others. In short, with light mixtures we start with the components and add for the desired result, and with pigments we start with the finished article and extract the desired color. From this it would appear at first glance to be a comparatively simple matter to record color by mechanical means, as sound is reproduced with such marvellous accuracy by some of the high-grade talking machines, but the difference between the two is that where in the case of sound the vibrations producing the highest and lowest audible

notes range from 16 to 40,000 per second, the light vibrations producing the two extreme visible colors, violet and red, range from 400 billions to 760 billions per second, which is rather beyond the limit of our present mechanical appliances. As a matter of fact, all the practical methods of color reproduction require the color to be resolved into its components and reassembled again, somewhat as if a chord had a separate record made of each note and the reproduction consisted in playing all three in unison.

One of the earliest methods of color reproduction, as first suggested by Clerk Maxwell in 1861 and later put into practical operation, consisted of three separate pictures superimposed by means of a triple lens lantern. Three separate exposures were made on three separate plates through blue, green, and red filters respectively. As the effect of the blue filter was to damp down the green and red ray vibrations, the plate was only acted upon by the blue portions of the subject and the blue components of all the other colors. Similarly the green and red filters gave negatives of the green and red portions and components. The resulting plates were negative, being opaque where affected by the blue, green, and red rays, but the positive transparencies were transparent in these portions. The light passing through the positive obtained from the blue filter negative represented the blue portion of the subject and the blue components of all other colors, and if this were projected through a blue screen or dyed blue, a reproduction of the blue parts of the original was visible on the sheet. The same with the other two colors, green and red, and as these three are capable of reproducing all natural colors, the registration by projection of the three colored positives on a white sheet gave a reproduction of the subject in all its colors. This we can safely say is the parent of all modern color reproduction, particularly the screen plate processes for which Messrs. Lumières' patents were taken out in 1904, although such a process had been suggested as early as 1862. Having succeeded in reproducing color with three separate plates, the investigators soon got on to combining all three in one, and in 1896 a screen plate with ruled lines in the three primary colors was patented, this being placed in contact with the sensitized surface and the picture taken through it, and after development and printing on a transparency the latter was registered with the screen again, and so the picture was produced. From this to dividing up the lines into

squares was but a short step, and so we have the commercial processes of today. There are representatives of two systems on the market today, one of the combined and the other the duplicating process. In the combined process the screen, composed of a large number of minute transparent grains dyed with the three essential colors, blue, green, and red, is formed on the glass, and over this is spread the sensitized film, which is, of course, always panchromatic. The plate is inserted into the dark slide with the glass side toward the lens, so that all rays pass through the screen before coming in contact with the film, the lens being fitted with the yellow filter already mentioned before exposure is made.

As a result of the exposure each of the three colors reflected from the subject acts upon the silver in the film immediately behind the screen grains of similar color. Development then blackens all these portions in the usual manner, giving a negative image, so the plate is then reversed, which converts the negative into a positive transparency for viewing by projection or transmitted light.

The duplicating method only differs from the combined in that the screen plate is a separate unit. In this method the taking screen is placed in contact with the plate, screen surface to film, and the exposure made through the glass side of the screen as before. The screen and plate are then separated, the plate developed and fixed, giving a normal negative from which a positive is made on a separate transparency plate, which is then registered and bound up with a viewing screen, and the picture is finished. From this negative transparencies can be made as often as required.

We will now look into the general principles of the printing processes. It is first necessary to appreciate fully the difference between projecting a picture and printing one. When projected the projection is through the portions of the plate which were affected by the light, *i. e.*, the opaque portions of the negative which became the transparent parts of the positive. When a print is made from the same negative the black or image producing parts of the print represent the transparent portions of the negative—exactly the opposite. From this we establish the principle that we project in the color that affected the plate and print in the color that did not affect it.

In the three-color projection process, projection was in blue from the blue filter, because that was the color that affected the plate, but for printing purposes we must use

the color that did not affect the plate, *i. e.*, the color that was stopped by the blue filter, and that is yellow—(green + red). When projecting, the opaque portions of the positive stopped the blue, and as these opaque parts are the pigmented parts of the print, we have to print in some color that will do the same, *i. e.*, suppress blue, and this is exactly what a yellow pigment does, as it has the property of absorbing, damping down or suppressing the blue rays and reflecting the green and red, which, when combined, give yellow. Therefore we print in yellow from the blue filter negative, red from the green, and blue from the red.

We can now proceed with the more practical details of our subject and examine the various processes as available to the amateur.

Probably the best known methods of color reproduction are the screen plate processes, of which the Lumière and Paget are the only surviving representatives, although a very excellent example was the Dufay plate, now unfortunately off the market, which is a distinct loss to color workers. They are all on the light mixture or projection principle, being viewed by transmitted light through the color screen, the small dots being invisible to the eye and producing the impression of an unbroken surface of color. Dufay was and Lumière is on the combined principle, and Paget is the duplicating system. They also represent three distinct types of construction, *i. e.*, ruled, dusted on, and mosaic.

The Lumière screen represents the dusted on type, and is formed of very minute grains stained with the three colors suitably mixed and rolled on to the supporting glass. This screen, when stripped of the photographic film and viewed in the hand, has a decided orange tint. The weakness of this system appears to be the unavoidable clumping of the grains of one or other of the colors, which often makes the screen pattern distinctly visible.

The Dufay screen represents the ruled type. In this lines of blue and red are ruled across each other and varnished, and then the third line of green is ruled between the lines of red. This screen, when viewed in the hand, is decidedly violet. This screen gave most excellent results, the depth and richness of coloring being exceptionally good, but the plates were frequently very defective, suffering badly from pinholes, which gave rise to green stain all round the defect.

The Paget screen represents the mosaic

type, being composed of symmetrically arranged squares of the three colors, and is a separate unit from the sensitized plate. The taking screen is used again and again, separate viewing screens being used for binding up with the positive. This screen, when viewed in the hand, is distinctly green.

For the purpose of comparing these three methods of screen construction actual screens were magnified 100 times and printed side by side on the same slide. To obtain the maximum contrast the negatives were made on ordinary plates, and in this positive slide from them black represents red, half-tone green, and white blue. In the Lumière screen, notwithstanding the minuteness of the grains, the masses of individual colors due to the clumping of the grains was at once apparent. An accurate analysis of the details is hardly possible from one small portion such as this, but roughly there are $3\frac{1}{4}$ million grains per square inch, varying from $1/1600$ to $1/1200$ inch diameter, and there appear to be about 26 per cent. blue grains, 36 per cent. green, and 38 per cent. red.

The Dufay ruled screen showed up well at this magnification, and notwithstanding the large size of the color patches compared with the Lumière, the screen pattern was far less noticeable in the finished picture. An interesting feature, hardly visible on the slide, was a minute black dot in the centre of each red square. Apparently the red was in excess and this method was adopted to cut it down. In this screen there appeared to be about 160,000 per square inch, the blue being $1/200$ by $1/700$ inch and the green and red $1/400$ by $1/300$ inch, with 30 per cent. blue, 35 per cent. green, and 35 per cent. red.

In the Paget screen the mosaic construction was obvious and requires no comment. There appeared to be about 120,000 per square inch, with blue $1/400$ by $1/320$, green $1/280$ square and red $1/600$ square, with about 30 per cent. blue, 40 per cent. green, and 30 per cent. red. For the purpose of demonstrating the capability of color plates to reproduce all colors with reasonable accuracy, a chart of strips of colored paper was made, a portion of which was available for actual comparison. The Lumière plate was taken November 25th, actinometer 30s, exposure 15 seconds at $f/8$, one-half being developed 4 minutes and the other $2\frac{1}{2}$ minutes to illustrate the effect of development on the resulting color. The Paget plate was taken at the same time, exposure 9 seconds at $f/8$. The transparency had 35 seconds' exposure, 12 inches from a candle.

Another Paget plate was exposed by Osram light equal to 130 watts, the exposure

being 35 minutes. The transparency had 40 seconds at 12 inches. The vast improvement in all the colors with the more stable artificial light was most noticeable. This draws attention to the difficulty of getting correct color balance. The standard yellow filter is obviously a mean giving average results with average light. In June one is apt to get excessive blueness throughout the picture, due to the intense blueness of the sky and light, which suggests under-correction, but in November, when the light is decidedly orange, the blue components are badly rendered, suggesting over-correction. The most accurate results as regards these rough tests were obtained by the more constant artificial light with its correct filter. This is a very big subject and requires considerable investigation, but it certainly appears probable that many of the faulty results we experience are due to the blue or violet rays which we have to correct and to errors in the necessary correction.

In criticising the actual colors reproduced by color photography we should always remember that we are asking a most accurate process to operate with all the limitations of human vision. We are apt to say the result is all wrong when the plate has merely recorded reflected color rays which we were unable to see. So that, as a matter of fact, the plate is correct and our perceptive faculties are in fault. Take, for example, the frequent exaggeration of the blueness of water. Is the plate always in fault or is it simply recording what it saw and we did not? In the first place the time exposure seems to penetrate the white sheen on the surface that hides the depths from us. We also know that the blue rays are the most easily scattered, to which we owe the blue sky, and it is quite possible that some such action which is invisible to us is recorded by the plate. Most of our estimates are obtained by comparison, and one great danger in color photography, *i. e.*, reflection, is due to this. In a plate which was exposed in a small greenhouse, the white table-cloth background caught the green reflection from the surrounding plants, but as everything appeared in the same light it was not visible, but the plate caught it.

This is a point that should always be guarded against, for if there is some strong predominating color in the subject, and also a suitable reflecting surface, there is always a chance of such a color fog. For the purpose of analyzing exactly what happens behind the screen after exposure, portions of the Paget negative of the color chart were

magnified about twelve times and printed in strips on the same slide, one strip from each color. This enabled the dot formation to be clearly seen and illustrated to what a great extent all the three primary colors contributed to the formation of the composite colors. It is not proposed to go fully into the detailed working of the screen plate processes, as this is given in the manufacturers' instructions, but a few remarks in passing may be helpful. The Autochrome plate is packed with the film in contact with a special black card, which has preservative qualities, and must be retained in contact in the dark slide. The combined thickness is about $5/64$ inch, and the Paget plate and screen is about the same if both are on the special thin glass. An ordinary modern plate is about $3/64$ inch. For this reason some of the modern slides are not deep enough for color plates, and if intending color workers are purchasing new slides they would be well advised to get the old book-form of slide, so that the plate only needs to be dropped in, as color plates and taking screens are very tender and suffer from the sliding action necessary for insertion into the fashionable type. The comparative speeds are Autochrome 12, Paget 4, with the yellow filters. A "Special Rapid" to the same scale is $1/6$. For an ordinary average landscape an Autochrome plate requires about four seconds' exposure at $f/11$ during the mid-day hours of May, June, and July. Correct exposure is of the greatest importance with Autochrome plates, as the color result depends entirely upon this. Slight over-exposure gives thin, weak colors, and slight under-exposure a rich and rather exaggerated coloring. A special intensifier for over-exposed plates is supplied by Messrs. Lumière, and under-exposure seems to improve a little by treatment with Farmer's reducer, but the correct exposure is the only satisfactory treatment. With the duplicating process slight errors in the exposure can be corrected in making the transparency, and this can be intensified or reduced, but not for the best results.

Messrs. Lumière supply a very rapid Quinomet developer, with which development is complete in $2\frac{1}{2}$ minutes, and a reversing solution of permang. of postassium. This rapid developer has advantages, as the Autochrome plate will not stand prolonged immersion, but all the examples in the frame were developed with Tabloid Rytol, requiring eight minutes, and reversed with Tabloid reverser. The duplicating process calls for no special comment, as, after exposure, the

procedure is exactly as for ordinary negatives and lantern slides, the one essential being perfect contact between the taking screen and plate, and again between the negative and transparency plate when printing. The matching of transparency and viewing screen sounds a formidable proposition, but in practice is quite simple and presents no difficulty.

The principles of color printing have already been dealt with and the practice is almost identical. The two well-known processes are the three carbon of the Auto-type Co. and the Raydex. The former is exactly the same as ordinary carbon printing, in which the tissue is rendered insoluble where exposed to the light. For three-color work carbon prints are made direct from the negatives, in yellow carbon from the blue filter negative, red from the green, and blue from the red. The Raydex is similar to the Ozobrome process of carbon printing, in which carbon prints are obtained from a bromide print by contact, the special tissue becoming insoluble where in contact with the metallic silver in the print. Bromide prints are taken from the three negatives, and from these the yellow, red, and blue carbons are obtained. The bromide prints can be redeveloped and used again and again. Beyond this point the procedure is the same, the three-color prints being transferred to temporary supports of celluloid before development, and developed on these supports. The yellow print is then transferred to the final support, the red registered with it and transferred, and finally the blue is registered with the orange already obtained, giving the final result after the transfer has been made. As all color plates are panchromatic they must be handled in total darkness, or if any light at all is used it should be green. Messrs. Lumière recommend their Virida papers of green and yellow combined. For oil and other weak lights they recommend two green and two yellow, and for electric light of 16 candle power, two green and three yellow. The plates should not be exposed to this light until development is well on the way, and then only for a moment, but time and temperature methods appear to be much the best for these processes.—*The Photographic Journal*.

The annual exhibition of members' work will be held at The Camera Club, New York, from September 1 to 30, 1921. The public is cordially invited.

A Bit of Blue Glass

The brilliant color of nature deceives the eye, and the photographer is often led astray in judging of the values in a scene; often a subject is attempted, not within the scope of monochrome translation. And, on the other hand, he is just as liable to overlook a picture most suitable for camera performance.

Now there is a very facile way to aid one's judgment in selection and judging of the scheme of light and shade in the scene. This scheme for the time being really makes the observer color blind, and so he is not distracted or deceived by the rich coloring.

Get a piece of cobalt blue glass, about four by five is large enough—a lantern slide size plate will do equally as well and be handier in transportation. It might be well to have the dimensions of this glass proportional to the size of the plate used. This sort of black Claude-Lorrain glass, or "view finder," for we must give it distinction from the "view metre," enables the artist to see the variety in the light and shade. He will notice that the foreground is darker in proportion to the distance, just as it will come out on the photograph. Now, in order to judge of angle of view, let him set up his camera and select some striking object on each side of his picture, to mark the extreme boundary, to get the angle, and then hold the blue glass sufficiently far from the eye to include the same objects, and then measure, etc., distance of the glass from the eye.

A very few trials will suffice to get the proper distance.

Simplicity

A picture may be made effective, either by simplicity or by richness of its harmonies.

A violin solo can delight by its exquisiteness, and so can a full, rich orchestra of flutes, bassoons, violins, trombones and bass drums.

The skill of the master is exhibited in both; however, there is more danger of failure in the struggle for brilliancy than in the natural yielding to simplicity. But, at the same time, there is a tendency to tameness from too much simplicity. There must be a rhythm and alternation, from high interests to repose.

A considerable portion of subdued tones is necessary to reconcile the leading highlights with the deep shadows. We must not see either, contending for mastery.

Gradations vary the scale and aid the harmony of the whole picture. Warm tints may be employed to check cold ones, and vice versa, but not in violent opposition.

The modern tendency in values is in the direction of less contrast than would have been regarded the right practice some years ago. The black color garment, for instance, is not relieved by white lace trimmings, and then set against a grey background to get pronounced relief; but the background is kept only a trifle lighter than the drapery and the lines of demarkation made soft.

To do this demands skill, to get delicacy without smudge, and consequently we see smudge oftener than refinement of line.

Cheap Printing Illuminant

For the last two seasons the writer, having to use a dark room far from the gas main, has been printing bromide papers by daylight. The noteworthy point was a better quality print and less waste than when gas was used. Through being further obliged to use a south aspect, the general experience has been: the stronger the light, the better average of prints. Quite the reverse was expected when the experiment was first made. Using a printing box of a simple pattern, the lantern was replaced by a portion of window-pane. Windows are generally away from the wall line of a room. The solution of carrying the light to the front opening of a printing box without spare light flooding the room and fogging material during handling proved at the same time that strong daylight could be used for bromide printing. All spare panes were closed with ruby medium. The one selected as level with the front of the printing box was fitted with a cardboard tunnel. Any size may, no doubt, be used, but mine is 8 inches by 8 inches and 8 inches deep. It is let into a small sheet of cardboard. One end touches the window-pane and the other is close enough to the shutter, worked by treadle of the printing box. The sheet of board is tacked to the framework of the window. Only in the summer has an opal been used, to cut off the strength of occasional reflected sunlight. (It shines right through tunnel at times on to the reflector in the printing box.) A reflector (white cardboard) is also used outside the window. In bright light a slight opening of the printing-box shutter (front is about 9 inches by 9 inches) gives exposure well under control. If it is any criterion as to the control possible

of shutter and daylight printing, I may mention that, using the Wellington M.Q. developer, I reckon on developing 30 to 40, and sometimes 50, singles at a time. Slight overs go early into the rinsing water. The normals go last comfortably into the fixer after rinsing. Any prints full strength early can be put straight into the fixer without worry. Portrait work in cabinet sizes and over are developed about 18 at a time. Most of my spoils are under-development; not over-exposure, as some might imagine from the nature of the illuminant. The system is not desirable for gaslight and slow papers. But the mouth of the tunnel, with the printing box removed, can be used as light-source for gaslight printing whenever light is constant. —F. N. in *British Journal of Photography*.

Permanganate Formulas

The majority of photographers do not realize how adaptable permanganate of potash is to the needs of the general worker.

This salt of potassium may be used for a variety of purposes, and it will be found that baths compounded with permanganate will compare favorably with other formulæ used for a like purpose, and in some cases excel them.

The object of this article is to collate the formulæ for various baths, of which permanganate is the principal agent, and also the processes for which the salt may be used.

NEGATIVE REDUCER.

As a reducer for negatives this salt has proved valuable. Negatives that have been inadvertently allowed to develop a little too much may be as easily reduced to the required density as the excessively over-developed ones. A strong solution for rapidly reducing the most dense negative is:

Potassium permanganate (5% sol.)	2 drs.
Sulphuric acid (10% sol.)	5 drs.
Water	10 ozs.

Apply this solution to a dry negative, wash immediately and dry. Again repeat this procedure, and a considerable softening of contrasts is obtained.

On the other hand, fairly even reduction may be obtained by diluting the above reducer to 60 ozs. and applying to a wet negative.

The strong reducer should not be used to reduce a negative with strong high-lights and shadow detail in clear gelatine, as the little deposit in the shadows will be re-

moved, as they would be with any single solution reducer when considerable reduction is desired in the high-lights.

STAIN REMOVER.

No matter how careful one may be, occasionally stains make their appearance on our negatives, but with the aid of an acid permanganate solution the fault may be rectified with ease.

Two methods may be adopted, one of which will permit the negative to be intensified during the process of removing the stain. Bleach the negative in either A., B. or C. solution of the late Welborne Piper's chromium intensifier, according to the degree of intensification required. Wash, away from strong light, until the bichromate stain is removed, place the negative in

Potassium permanganate (5% sol.)	2 drs.
Sulphuric acid (10% sol.)	5 drs.
Water	5 ozs.

from 2 to 10 minutes, until the stain is removed. The negative will have taken on a characteristic brown stain, which can be easily removed with a 1 in 10 bisulphite lye or a 2 per cent. potassium metabisulphite solution.

Pour either of these solutions on and off the negative until the stain is removed, but discard the clearing bath when any discoloration is visible, and use fresh solution. Wash the plate for a few minutes and develop with a normal amidol developer to complete the process.

The second method and the more direct for removing pyro stains is the formula published by Ilford, Ltd., in the "B. J.," May 5, 1916, providing no intensification of the negative is required.

Soak the negative for 10 minutes with constant rocking of the dish in

Potassium permanganate	50	grs.
Common salt	¼	oz.
Acetic acid (glacial)	1	oz.
Water	20	ozs.

wash briefly and transfer to

Potassium metabisulphite	1	oz.
Water	20	ozs.

until the bleached image is quite white everywhere to the back of the film.

Redevelop the image in any non-staining developer, such as amidol, when a good, neutral black deposit, with clean shadows, is produced.

If the negative has not been dried before the treatment is applied, harden the negative in a solution of

Chrome alum	10	grs.
Water	10	ozs.

as the film is liable to become a little more tender in the process.

BLEACHER FOR SULPHIDE TONING.

Probably the best-known formula containing potassium permanganate is the one popularized by Mr. T. H. Greenall for bleaching prints previous to toning by a solution of sodium sulphide. Many words have been written eulogizing this bleacher, and with justice. It has the power of clearing up the high-lights and tones a correctly developed print to a pleasing cool brown color, quite free from any trace of yellow. The writer prefers the acid bleacher, as it is less trouble to compound than the formula containing sodium chloride, and the remarks in the previous paragraph apply to that formula.

Two stock solutions are required:

A.	
Hydrochloric acid	10%
B.	

Potassium permanganate 5%
For use, take A 1 oz. and B 30 mins.

This formula is considerably stronger than the one suggested by Mr. Greenall, but it has been found necessary to complete the bleaching within a reasonable time.

Both stock solutions keep indefinitely in stoppered bottles, but the working mixture must be made up at the time of using and discarded when it shows any sign of discoloration or turbidity, as trouble may be experienced where the sediment which is formed touches the print.

The prints are transferred direct to the sulphide bath, which should not be stronger than 2 grs. to the ounce, where any brown stain due to the bleaching bath will generally disappear. Should the sulphide bath fail to remove the permanganate stain, a quite effective clearing bath is 1 per cent. solution of potassium metabisulphite.

REBLEACHING SULPHIDE-TONED PRINTS.

It sometimes happens that a sulphide-toned print is not quite the color desired, particularly so when the exposure of the print, for the reason of excessive contrasts in the negative, has had to be increased and development not carried out to the limit. When it is deemed desirable to improve the color of any sulphide-toned print, resort may be made to the bleaching bath already given, and it will be found to bleach out nearly as rapidly as a normal print. Apply a weak solution of sulphide (about 1 gr. to 1 oz. water) to the print, and a darker and much-improved color will be the result.

Should, however, it be desired to reconvert a sulphide-toned print to a black tone,

use the same bleacher and redevelop the print in the following acid amidol developer:

Sodium sulphite	$\frac{3}{4}$ oz.
Potassium metabisulphite ...	80 grs.
Amidol	30 grs.
Water	20 ozs.

Pass through the hypo bath, then wash and dry.

REDEVELOPMENT FOR IMPROVING PRINTS.

This useful salt may be also used for bleaching a bromide or gas-light print to improve the color and contrast.

It not infrequently happens that an enlargement has to be made from a negative with excessive gradations, and resort is made to abnormal exposure and development. The bad color of the print shows the method of its production.

Prints of this type can be readily improved and a warm black tone obtained on most bromide papers by the following method:

Bleach the print in	
Potassium permanganate, 5%	120 mins.
Sulphuric acid, 10%	40 mins.
Sodium chloride	30 grs.
Water	10 ozs.

Wash the print for 10 minutes and redevelop in strong day-light with a normal amidol developer, without any addition of bromide. Wash the print again for a short period, and the process is complete.

Slight intensification is obtained by this method, but should this increase in strength be deemed insufficient, greater intensification can be obtained by first sulphide-toning the print, washing, rebleaching and redeveloping in the formulæ already given in an earlier portion of this article.

HYPH ELIMINATION.

The rapid elimination of hypo is occasionally necessary, and no better chemical can be used than permanganate of potash. Rinse the negative for a short time in running water, and, meanwhile, make up a solution of permanganate of potash of a pink color. Lay the negative in a dish and pour on a small quantity of the above solution, which must be removed so soon as the pink color is altered. Repeat this procedure with fresh solution until the color of the permanganate solution is not discharged.

HYPH TEST.

Permanganate may be also used to test the presence of hypo in negatives or prints. For this delicate test make up a solution of potassium permanganate of a light rose color and place a small quantity in two test tubes, or other glass vessels. In one tube allow the drippings from the negative

or print to be tested to fall into the solution; if no change of color is apparent when compared with the untouched solution, you may be assured that the negative is free from hypo.

The dilute solution for this test should be used soon after mixing, owing to the water causing the solution to lose color.—*The British Journal of Photography.*

Some time ago the Wollensak Optical Company, of Rochester, N. Y., issued a booklet entitled "Studio Lenses," which afforded a fund of valuable information for portraiture work.

The Company now announces a supplement to the previous work entitled "Commercial Lenses," which covers a field about which there is much inquiry and which will prove of particular interest to workers in this province of photography. Clear, comprehensive and understandable description is given of the nature, quality and mode of application of the different lenses for special use.

Both these booklets will be sent free on request to the Wollensak Optical Co., Rochester, N. Y.

Another Developing-Fixing Formula.

The following formula for combined developing and fixing, which procedure has of late been much discussed in French journals, has been tried out on a small scale with some success.

Water	100 c.c.
Amidol	0.5 gram
Sodium sulphite, dry ...	3 grammes
Acetone	8 c.c.
Hypo	5 grammes

It is advisable to make the mixture up shortly before it is to be used. A plate was given a normal exposure and then immersed in the mixture. Development began quickly, and was allowed to proceed for about 15 minutes, when the plate was washed. The image was sharp, and, although the whole surface of the plate was covered with a yellowish, somewhat glistening film, which, though essentially fog, does not seem to injure seriously the printing quality of the plate. The acetone makes the plate slightly resistant to water, and it is advisable to rinse it under the tap before placing it in the slow-flowing wash water.

The developer becomes quite turbid, with a fine, dirty yellowish precipitate, which resembles reduced silver.

Notes from Foreign Sources

Direct Color Photography in Medicine.—The demonstration of colored lantern-slides at the Section of Dermatology of the Royal Society of Medicine (says the "Lancet") showed the possibilities of this new method for purposes of illustration and teaching. Uvachrome diapositive lantern-slides are made from the original films employed in a new process of natural color-photography in which no screen is employed; the minutest details can thus be projected upon the sheet without the loss in accuracy caused by disintegration of the colors. The dyes used in the preparation of the films reproduce the original colors with remarkable accuracy. The process does not lend itself to mass production, but it is found to be of the greatest value for scientific purposes. The slides are at present prepared by the Austrian State Institute of Photography, which keeps expert photographers at the disposal of the Viennese hospitals and clinics, so enabling accurate color photographs to be made of cases of special interest. The negatives provide a record for the hospital archives, and furnish medical lecturers with the slides of individual subjects which they need. It is proposed to carry out the same work in England for the benefit of medical authorities in the hospitals and universities. If, as the makers claim, the films can be satisfactorily reproduced on paper, they should prove very valuable for use in text-books and in original articles on rare diseases.—B. J.

Photo Mittheilungen gives the following formula for developing weakly printed P.O.P.

The paper is but partially printed and placed without washing in:

Distilled water 100 c.cm.
Potassium meta-bisulphite. 7 grammes
Metol 0.5 grammes
Gallic acid 0.5 grammes
Citric acid 1.5 grammes

before using dilute with ten times the volume of water.

After development place prints in a weak solution of salt (3 per cent.) which checks development.

They are then rinsed in water, if desired, they may be toned in an ordinary gold bath with sulpho cyanide. After toning, rinse, and fix in a 10 per cent. hypo bath (although the formula does not differ much from former ones, the results are said to be better).

Hyposulphite of ammonium fixing bath: Ammonium hyposulphite has been recommended as a more rapid agent than the soda hyposulphite for fixing.

Recently for the same purpose it has been recommended to employ a bath composed of a mixture of ordinary hypo and ammonium chloride, which practically amounts to the same.

This mixture, however, is easy to prepare and much cheaper than the ammonium hypo supplied by the chemist.

Photo Review gives the following formula:

SOLUTION A.

Hypo (soda) 24.8 gr.
Water 50 c.cm.

SOLUTION B.

Ammonium chloride 10 gr.
Water 50 c.cm.

After dissolving separately, add A. and B. The following gives an acid fixing bath:

Hypo (soda) 60 gr.
Water 270 c.cm.
Ammonium chloride 20 gr.
Sodium bisulphite 3 gr.

Professor Namais in *Wochenblatt* claims that hard negatives may be made to yield soft, harmonious prints by treating them with potassium permanganate.

The following formula is given:

Water 300 c.cm.
Potassium permanganate.. 1.5 grammes
Acetic acid 2 grammes

Immerse the plate until sufficiently browned, then wash and dry.

The coloration from any special area in the negative may be removed by means of a solution of bisulphite of soda, which may be applied locally with a brush.

Death of Peter Cooper Hewitt

News comes from Paris of the death of the distinguished American scientist, Peter Cooper Hewitt. Mr. Hewitt devoted the major part of his life to the improvement of mechanical processes and electrical contrivances. Since 1898, however, he confined his attention to the study of electricity. In this field he made his reputation as an inventor and established his name with the other eminent world laborers in this department of physics.

With photographers, his name is especially associated with the celebrated Cooper-Hewitt light.

The Joke That Failed

Standards of humor differ in the different nations, and often that which invokes laughter in one place provokes anger or tears elsewhere. Some months ago Mr. R. E. Crowther in an article in the *British Journal of Photography*, relating to phenosafranin, remarked, in passing, that it is a matter of regret that the discoverer of the procedure had not had the luck to be born in England. Mr. Crowther probably had in his mind the wisdom of Ralph Rakestraw, who

"In spite of all temptations
To belong to other nations,"

remained an Englishman. A German writer, however, took it in high dudgeon, regarding it probably as another injustice upon an oppressed people, and now comes Ernesto Baum, in *Il Corriere Fotografico*, also with a similar complaint. Italian sympathy with Germany has been rather strong for many years. In spite of the bitterness of the recent war, friendly relations with Germany were quickly established between the two nations, and it was noted a few months ago in this journal that German supply houses were advertising largely their wares in the Italian journals. Baum, however, brings in the same article, another charge, which is really worth attention. He states that an American journal in giving an account of the use of the desensitizer, ascribes its introduction to a British firm and makes no mention of the original inventor. This, if true, is to be much regretted. Science knows no nationality; credit for the discovery of the usefulness of phenosafranin belongs wholly to the Munich photographer, and he should receive it. He showed the true scientific spirit by giving his discovery to the world.

An Economical Printing Method

Mr. C. E. Bergling, of Wiesbaden, Germany, contributes to a recent issue of the *Photographische Rundschau*, a method of printing which he claims will give results fully comparable with those obtained by platinum, permanent, less expensive than the silver papers and, of course, far below the cost of platinum papers. The image acquires a fine black tone without special toning. The procedure is substantially that of the kallitype, the principle of which is the sensitiveness of ferric oxalate, which is reduced by contact with light to a ferrous state, this in turn being capable of reducing silver salts. The published formulas for kallitype work were, however, found by

Bergling to be complex and unsatisfactory, so he devised new solutions. As the sensitive salt, he found most satisfactory ammonium ferric oxalate, which is obtainable of good quality from chemical supply houses. Five solutions are prescribed, as follows:

- (1) 20% ammonium ferric oxalate
- (2) 2% silver nitrate
- (3) 1% ammonium dichromate
- (4) 1% oxalic acid
- (5) 10% hypo

A smooth, well-sized drawing paper is selected. The sensitizing with the iron solution may be carried out by a dim artificial light, using a hair brush of size adapted to the size of the sheet, spreading the solution lengthwise and breadthwise until the paper is well impregnated, indicated by the uniform sheen that the surface exhibits. The brush is then squeezed out and used to take off any excess of solution, as there should not remain any liquid which can run into a pool when the paper is held inclined. The paper is dried as quickly as possible in the dark and then exposed under the negative. No image is apparent, hence means must be taken to determine whether the exposure is sufficient. Bergling does this by using a strip of the sensitized paper, as long as the negative and about an inch wide. This is exposed for a brief period under the negative, a piece of black paper is slipped over one-third of the sheet and the exposure continued for a similar interval, then the black slip pushed up so as to cover two-thirds of the paper and another period of exposure given. This slip is then passed with a uniform motion, coated side down, through the silver solution. The image appears promptly. The slip is washed and can then be examined in daylight, to determine the proper exposure by comparing the several impressions. With dense negatives the duration of the intervals must be greater, with thin ones, less.

In making the prints, a sheet is chosen somewhat larger than the negative, sensitized over the necessary area, and exposed as indicated by the trial slip. If it is desired to copy a part of the negative, the other portion can be covered with opaque paper. The sheet is then developed by immersion in the silver solution and washed for ten minutes with several changes of water. It is immersed in the oxalic acid solution (No. 4) for a couple of minutes and again washed for ten minutes in changes of water. Fixing in the hypo follows, and then the last washing, which will require about one hour. It may be dried by means of blotting

paper under slight pressure. Retouching, if needed, is easily performed.

With weak negatives that it is not desired to intensify, a good print can be obtained by adding to the sensitizing solution a small amount (about one-twentieth) of the ammonium dichromate solution (No. 5). The silver solution when first prepared keeps well, but after being used contains some of the iron salt, and both it and the iron solution should be kept in the dark.

Screens or Ray Filters

THE necessity of having the proper screen for absorption of particular rays, in conjunction with orthochromatic photography, is one not always duly considered, and the consequence is, the full virtues of orthochromatic manipulation is not secured.

These screens may be purchased and they perform admirable service, but those who wish to make screens for any particular case will find the following methods of preparation trustworthy:

Screens which will completely absorb blue rays, but not yellow or green, may be made by mixing in equal volume a 1 per cent. aqueous solution of aurantia and a 20 per cent. solution of gelatine.

Screens to absorb green and yellow may be made by mixing twenty-five parts of a 20 per cent. solution of gelatine with 30 per cent. solution of rhodamine.

An aurantia screen and a rhodamine screen superimposed (films in touch), will shut out all rays but the red. This method is necessary, since we cannot mix the ingredients of the two screens and flow upon one piece of glass, the rhodamine being precipitated.

The screens are made by flowing the solutions on glass.

Photographing Stars Near the Sun's Edge

In the past it has been necessary to wait for an eclipse of the sun before it was possible to photograph a star in the vicinity of the sun's disk. The intensity of the light of the sun is so great that even the sky for a considerable distance from it is very bright, and sufficient to overwhelm completely the image of any stars that might be in the field. This can be better understood when it is stated that the brightness of the sun is equal to 120,000,000,000 first-magnitude stars.

The subject of the apparent position of the stars, as seen near the sun's limb, has

recently become of great theoretical importance in connection with the gravitational theory of Professor Einstein, says the June *Popular Mechanics*. At the last eclipse photographs were obtained of stars near the sun; and the results appeared to indicate that Einstein's theory was borne out. However, the question is of fundamental importance to physicists and astronomers, and the effects are so minute that further data are wanted before a final conclusion is drawn; and it has been naturally assumed that additional information could not be obtained.

It has just been announced, however, that a French scientist has succeeded in photographing stars in the vicinity of the sun in broad daylight. This is accomplished with the aid of a screen which intercepts the direct image of the sun, and the effect of the intensely bright sky is disposed of by using suitably stained photographic plates making them sensitive to the red light, and by the employment of red filters which only allow light of certain wave lengths to pass through. It is possible, therefore, that it will not be necessary to wait for another eclipse before obtaining additional data on the Einstein theory.

Spotting and Taking Out Defects from Screen-Plate Color Transparencies

THE films of all screen-plate color transparencies are very delicate, particularly the Autochrome, which calls for very careful handling. Many of the color pictures that I have seen bear witness to the fact that this essential was not fully realized by the photographer; for not only do spots, pinholes and other defects manifest themselves, but many workers quite fail to take them out in a satisfactory manner, or ignore their presence altogether. Nothing tends to detract so much from the beauty of a color transparency than defects of the kind mentioned, and it is, to my mind, more important that they should be avoided, or at least touched out even than is the case in ordinary photographic work.

I must first point out that the taking out of defects in a screen-plate color transparency must be adapted to suit the character of the image formed upon the plate; and, except under the most favorable conditions, involves some risk of making the last state of the transparency worse than the first. The photographer has, therefore, on account of the peculiar delicacy of the

plate, to make his choice of leaving the defect alone, or of risking the total spoliation of the plate; but it should be added that this is not very likely if the work is approached carefully and in a commonsense way. It cannot be too strongly emphasized, however, that the photographer must keep carefully before him how very delicate and easily injured the surface of an Autochrome plate really is, when compared with what an ordinary plate will permit in the way of wrong treatment without harm resulting. Further, even the simplest spotting, no matter how carefully done, will still be visible on the finished picture; and a bad defect, no matter how skillfully treated, is almost impossible to eliminate entirely. From this it will be seen how important it is to *prevent* the possibility of such making their appearance, by careful, systematic methods of working, and by an implicit following of instructions.

One of the commonest defects met with among Autochromes is the green spots of various sizes, caused by the abrasion of the film, the varnish coating allowing moisture to penetrate the screen. The effect of water, or even moisture, upon the more soluble dyes composing the screen is very rapid; and I have known a plate taken from its final brief washing, after the film has been slightly scratched, which developed a circle of intense green while the drying was in progress. It is quite possible for the film to be broken, and no harm result, unless the varnish protecting the screen becomes perforated as well, allowing the admission of moisture. These green spots are troublesome defects to get rid of, as they are often of quite a large size; and, by reason of their intensity, ordinary spotting is of very little use at all. There are two or three suggested methods of minimizing these defects, though I have yet to find one that is satisfactory, and not easily detected. The late Mr. McIntosh recommended that the spot be clean cut out—a job that I must confess that I have never yet succeeded in doing very successfully. A lantern, or other slow plate of the same size as the transparency, is exposed behind the latter for a very brief period; developed in the ordinary way to obtain a faint grey image; and fixed and washed in the usual way. The spot is then worked up with transparent water colors, and registered with the Autochrome, serving it for a cover glass. It must be kept in mind that it is difficult to “match” with hand work a chemical image. This applies

more to color transparencies by the screen-plate methods than to ordinary methods of working up.

We now come to consider the taking out of defects caused by the damaging of the photographic film, without the screen being injured or discolored. It is sometimes possible to repair a scratch or vacant place in the picture by fixing upon it another piece of film of the same color taken from another spoilt plate. This latter is cut out very carefully with the point of a sharp penknife or an old safety-razor blade, keeping to the shape of the original defect as closely as possible. This latter is then given a fine coat of clear gum, the piece of new film gently coaxed into position and allowed to dry; after which any irregularities may be very much minimized by careful working up with suitable transparent water colors. The majority of beginners make the mistake of using too large a brush; most of my own work is done with a No. 2 sable. The colors should be used very dilute, for it is better to secure additional density by means of two or more applications than to risk matters by over much hurry or by the application of too much color at once. It should be kept in mind that these colors are really stain; and, once applied, are not removable like ordinary colors, even if the film of the plate would stand such treatment. No attempt must be made to wipe off the color if too much has been applied, for such would only injure the film. If any difficulty is found in making the color “bite” on the smooth surface of the film the brush should be moistened with a little clear, thin gum water prior to taking up the color. All spoiled Autochromes should be saved, for they are most useful for testing the effect and correcting the density of an application of color before experimenting upon a valuable transparency. If, however, an Autochrome is not available, an old negative may be employed for testing colors.

We now come to consider the spotting-out of simple defects, such as pinholes; and there are very few plates, indeed, that do not call for some attention in this respect, no matter how careful the photographer may be. It is most important that, even for simple spotting, the transparent water colors be used, and not the ordinary artists’ talc colors, since these are quite opaque and useless for the purpose. I have seen many color transparencies which were completely spoilt by these being used.

Though almost all plates require a little spotting, it is a mistake to run the risk of overdoing this. The screen of an Autochrome plate itself will often allow small pin-holes to be almost invisible, especially when they come against the sky or other brightly lighted part of the composition. In color work, in common with other forms of photographic spotting, it is far easier to take out or render less evident defects in the darker parts of the subjects than when these appear against a light portion. When spotting an Autochrome plate the beginner often works with his eye too close to the transparency, and then obtains a false sense of the amount of color needed to make the defect invisible. The larger the transparency the farther it is held from the eyes in the case of a person of normal vision, and a minute touch of the *right* color may have the effect of hiding an ordinary pin-hole far more effectively than would a much deeper application. Too little care is often taken in adjusting the *depth* of color to suit the surrounding area; and in the proper observation of these details will be found the secret of success in spotting color plates. The actual spotting differs in no way from that employed on negatives and prints. A small pin-hole should be completely blocked out with one touch with the point of a nearly dry brush, while a larger defect may be considerably modified with several touches. The idea is to fill out the defect with just enough harmonizing color of the same transparency; this grasped, there is little to add. Of course, no attempt must be made to alter existing colors or effects. Such may seem possible in theory, but, apart from being quite illegitimate, are unsuccessful in practice.

So far, I have mentioned the Autochrome process mainly, though much that has been written applies also to the Paget process, though I must say in my own experience spotting is less frequently necessary with this method, since the films of both negative and transparency plates are much harder; and, provided reasonable care is taken, the negative, or positive, should require little or no spotting. When this is required, however, great care must be taken not to carry things too far in the matter of spotting, by reason of the fact that a Paget color picture is much more transparent than an Autochrome. Also, very careful mixing of the colors is essential, or the result will be that the pin-

hole shows as a spot of intense color. My own plan, when a Paget color transparency requires spotting, is to attempt to do this on the negative, so that none whatever will be needed upon the transparency; and, if this is done carefully, it will not be found a very difficult matter. As with Autochromes, the transparent colors must be used, for the additional reason that if the ordinary opaque artists' water colors are used their somewhat gritty composition is almost certain to scratch either the viewing screen or the transparency when registering. This trouble need not be anticipated with the transparent colors, though the two plates should not be moved about upon each other more than is necessary, or the slight irregularity created upon the film by spotting may cause scratches upon the surface of the viewing screen. It will be found best to register the transparency prior to spotting, so as to gather some idea of the tint required; the two plates being clipped together while the colors are mixed and their effect tried upon a spoil plate. The two may then be separated, any grit or dust removed, and the spotting done. Care must be taken to see that the color is thoroughly dry before re-registering. During this stage the photographer must be careful to avoid removing the spotting by the friction between the glass; the movement should be very gently done, or scratches to one or other of the surfaces may result. So far I have only mentioned the spotting of the transparency plate, but it sometimes happens that a tiny pin-hole in the viewing screen may be profitably filled in with a spot of color. It is only fair to add that this should be very gently done.

I believe that few workers varnish their Autochromes other than those required for lantern projection, owing to the difficulty that beginners always experience in getting an even application of the varnish. There is really no need to varnish color transparencies, from the point of view of protecting them, though varnishing will protect any spotting during the fixing of the cover glass and binding up the picture. Paget color transparencies should not be varnished, as the interposition of even such a thin film between the plates would tend to prevent the perfect contact between them upon which depends the production of a perfect color result.—Robert M. Fanstone in *The British Journal of Photography*.

Green Toning for Transparencies Not a New Procedure

The *Photographische Rundschau* calls attention to the fact that some formulæ for a combination of uranium and iron compounds for green toning, published as recently devised, are really quite old, the method being substantially that given by Vogel in 1895. The method is, indeed, excellent, possessing, among other advantages, that the depth of the tone can be regulated by changing the relative proportions of the uranium and iron salts. It is necessary, however, not to allow the proportion of the former to fall very low, as the plate has to be well washed, and under this operation may lose enough uranium to leave a yellowish brown residue, which will affect the tone. The proportion of the active substances must also be so arranged that the toning due to the uranium is not inferior to that given by the iron or the plate will be too blue. The following formula is given:

1% uranium nitrate solution...	40 c.c.
1% ferrous ammonium citrate solution	20 c.c.
5% citric acid solution	15 c.c.
1% potassium ferricyanide solution	60 c.c.

After fixing, as noted above, the plate must be well washed. If the plate has not been recently taken, it is well to give it a short washing before applying the toning solution.

Keeping Qualities of Developers

Another French chemist, M. J. Desalme, who has previously made several contributions, to the subject of developers and development, has published a process which he has had in use since 1912 for preventing the oxidation of the ordinary developers, which can be used until the accumulation of bromide in the course of development renders them too slow in action. M. Desalme, after a systematic study of many reducing substances able to regenerate the developer from its products of oxidation without acting either on the latent image or the unaffected silver bromide, and also capable of addition (without precipitation) to developers containing sulphite and alkaline carbonates, has made choice of a double soda-stannous tartrate, which he prepares as follows: Dissolve 10 gms. crystallized stannous chloride and 15 gms. powdered tartaric acid in 50 to 80 c.c.s. of boiling water. After cooling to nearly the ordinary temperature, pour this solution slowly and with constant

stirring into a cold solution of 25 gms. dry soda carbonate in 250 c.c.s. of water. Make up to 400 c.c.s., let stand for at least 12 hours and filter. This solution is used in conjunction with alkaline developers by adding about 40 c.c.s. to each 1,000 c.c.s. of the working developer. In using it with developers, such as diamidophenol, not suitable to the employment of a strongly alkaline salt, the stannous tartrate solution is first neutralized or very slightly acidified by addition of sodium bisulphite up to a point at which the mixture, after thorough stirring, slightly renders red the blue litmus paper. I have been able to keep diamidophenol developer "preserved" in this manner in good condition for over a week in an open vessel, whilst similar but unpreserved developer was useless within less than an hour. Although the stannous tartrate compound decolorizes many dyes, it has no action on safranin, and it does not interfere in any way with the desensitizing powers of these dyes.

My experiments with alkaline developers, other than a special developer (quinol and paramidophenol) commended by Mr. Desalme, have not had the same success. —*British Journal of Photography.*

The Gorsky Process of Color Cinematography

A private view was held in London recently of a short length of film, the first to be shown, prepared by the process of color cinematography, which has been worked out by Professor S. M. Procodine-Gorsky. The film, taken on the Riviera in September last, had as its subject a slight incident of matrimonial misunderstandings. The eternal triangle of the cinema theatres apparently is an obsession even of the technical experimenter in cinematography. So far as the technical result is concerned, it was explained that the film had been taken with the object of showing the practicability of the process, and therefore had been made at a stage of its development at which the causes of certain minor defects had still to be eliminated, whilst the mechanical equipment for the printing of the colored films was that of the experimental laboratory, and not of the factory. With these allowances to be made, it was not the easiest matter to form a definite opinion of the process. The film was certainly very transparent, yielding a bright picture on the screen, and many of the textures, and particularly flesh tones, were well rendered.

Scarcely any technical particulars of the process are available, but it is stated that the negative is made at triple speed, and, presumably, that each successive series of three pictures on the negative is used as the set of color-sensation negatives. From each of these three a separate color impression is produced, and the three assembled in register, so that the film is a series of complete color pictures on a film which can be shown in any cinematograph projector. It would seem that the several color impressions are produced by a mordanting process of dye-toning. But presuming that the foregoing is a description of the process in general terms, it seems somewhat difficult to understand in what way identity of the images in three successive picture sections is obtained. If the subject is in rapid movement, it would seem inevitable that the image must differ from one picture section to another, even when taken at triple speed, a defect which would give rise to want of registration, and thus to the color fringing, which is the rock on which many processes of color cinematography have foundered. It may be that we are not fully informed of the basis of Professor Gorsky's process, which, at a luncheon following the demonstration, was described by Mr. Sanger-Shepherd as being a sound one, and as having yielded a film, parts of which were technically perfect. It is clear, however, that Professor Gorsky has progressed some way towards the goal which has been his ideal for many years past, and we wish him all success in his further progress.—*British Journal of Photography*.

Paper Negatives Extending in Use

The initiative of certain German firms using paper instead of glass as support for the sensitive films has provoked similar efforts in other countries, and, at a recent meeting of the French Society of Photography, a newly invented form was presented on behalf of a French firm. It is designated as "*Folio-brom*." The exact composition is not given, so that it is not possible yet to determine how far it is merely an imitation of the German product. The description of it is preceded by a statement that such articles are not new, and then, as is unfortunately too much the custom of our French brethren, a claim is made for the origination of the method in France. "*Folio-brom*," we are told, consists of pellicule, detachable after fixing, washing and drying. The emulsion is ultra-

rapid, and by the nature of the support free from halation. The pellicule is without grain and can be retouched on either side, and, as noted in the earlier accounts of such articles, the film can be reversed, thus avoiding double transfer. The sheet curls a little on immersion in the developer, but soon flattens. It can be dried by means of alcohol if desired. The lightness, freedom from breakage, ease of cutting and much lower cost are great advantages.

It seems likely that these advantages will appeal to many photographers, and the demand thus created will lead to rapid improvements in form and use.

Inconsistency in Color Schemes

It is much to be desired that one might have a tolerably clear idea of what produces the variety of color of which white light is said to be composed. There is so much contradiction that one is in a quandary to understand what really the investigators mean.

White light is said to be a combination of all the colors. Has this been proved? We can produce white light by the combination of two colors—red and green—what is the use of the other colors?

While, theoretically, green is said to be compounded of blue and yellow, it is found in practice that a blending of blue and yellow light makes white—not green. Green, we are told, is a primary color, because it cannot be analyzed into any components, and red and violet are also classed as primaries. The union of blue and yellow produces white and not green, and Hemholtz has remarked this as a most striking difference between the mixtures of pigments and the blending of colored rays. What is the relationship of white to green? Some investigators even say that white is really a color in the spectrum, having a place immediately below the green and differing from green by a shade only. Hence the difficulty of getting green by combination.

In the case of purple and green, which yield white on mixing, we note that purple is not in the spectrum, but is a mixture of violet and red. How is this to be explained by the theory of three primary colors?

Such are the anomalies presented by a study of color. Is it any marvel that one would like to know the truth, or at least to have some more consistent theory than the one admitted as the best explanation of the phenomena of color vision?

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TRAINING THE EYE TO DISCRIMINATE

EVERY one will allow that the hand is susceptible of almost unlimited education, but few of us ever think that our visual perception, like the manual exercise, becomes automatic by unconscious training, by a long and patient experience. And in our own individual experience as photographers, if we stop to consider, we must acknowledge that it was only after repeated trials that we were able to appreciate the marvelous play of light and shade in the molding of the human countenance, to notice how the interchange brings out character, determines expression, subdues certain irregularities, gives strength and emphasis to parts, as well as delicacy and grace.

But if we shall stop to analyze, in a sort of way, how we came by this experience—why it was not patent to our observation in our first experience in portraiture work—we shall discover that our perception in our early practice was hindered from just estimation of the effects of light and shadow by the influence of an altogether unsuspected factor. In the study of the human face, as delineated upon the ground-glass of the camera, the photographer, and indeed the painter himself, in the early practice of their respective arts, are hampered or rather deceived by the distracting presence and inseparable association of Nature's subtle coloring of the image.

This deceptive agency of color is most especially manifest in portraiture. Color, most pleasing in its own intrinsic quality, by masking more or less the effects of light and shade, neutralizes whatever crudities of illumination there may be present.

Most of us may recall our first attempts at pictorial work with the camera, how disappointed were our sanguine expectations. The vision of loveliness pictured upon the ground-glass was not materialized in the black-and-white reproduction.

Color so compensates for, or so supplements irregularity and discord of shadow, that our object looks to us charming, which would in nowise attract us divorced from the beautiful tints in which Nature has arrayed it.

The painter, in his early experience, before his faculty of correctly estimating the part played by light and shade has been developed, is instructed to employ mechanical devices to educate his vision.

Such devices really, for the time being, convert his vision to the condition of that of one color-blind.

After such a training of the eye, he becomes possessed of the ability of independent judgment, of studying and appreciating combinations and associations of light and shade with color; for we need hardly remind you that in Nature there is no absolute black and white. All is color shade, and every shadow cast is cast in color or in fringes of varying tints. But sufficient for us photographers is a training in the line of appreciation of colored lights and shadows as wholly colorless. We must forego the enjoyment color affords and look at the human countenance as a mere scheme of black and white.

It is a common but erroneous opinion that handsome people do not invariably take good portraits. The refutation of such an opinion is hardly needed when we stop to consider that initial beauty in a subject must necessarily be accessory to beauty in the reproduction. The reason for the disparity, or supposed disparity, you will see lies in the deception occasioned by the transforming agency of color, as we have said. The vision has been led astray by the freshness and charm in the model, added by color.

The ungainly factors of light and shadow from illumination, and even the uncomely lines of the features, are less perceptible than they would be if color were differentiated.

Now, briefly for the lesson to our art of photography. The great essentials in portraiture practice are first to learn to appreciate a beautiful thing when presented, "to know what beauty is, see where it lies," and not to take worst for the best; and second, to disassociate the subject from its irrelevant surroundings—and, in our especial province, to be wary of color deception, of its potency to veil from our inexperience what is contributory to disappointing final results. Take also heed to this—that success depends also upon the training of the eye to a peculiarity incident upon photographic studio illumination, an experience not required in the painter's practice, and that is the necessity on the part of the photographic portraitist to allow for variation of effect of illumination in the finished picture and in the studio surroundings when the picture is projected on the ground-glass screen.

In a word, the photographer is apt to be deceived as to the quality and degree of illumination under the skylight. A strongly illuminated head, such as would delight the painter, and, for that matter, also please the photographer of artistic perception, would yield on the negative a picture unpleasing by giving too much contrast and have too little gradation of shadow, although to the vision the gradations would all be present in the model.

The pupil of the eye acts, under strong illumination, like the small dia-



"OUT-DOOR PORTRAIT"

WILL ROUNDS

phragm of the lens and softens the harshness, shutting out the unpleasant flood of illumination, and so we mentally believe that our model is arrayed in a soft, harmonious light; but our remorseless, sensitive film registers the harshness with all its disagreeable effect.

The skilled operator knows that he must depress his brilliancy of illumination, no matter how charming it may act upon the modeling of the head, by the interposition of screens and blinds, to humor, as it were, the relentless and indiscriminating glass optic, which is devoid of the compensating automatic blind to depress too great intensity of light.

We must study how to determine what modification of light is demanded to overcome natural exaggeration.

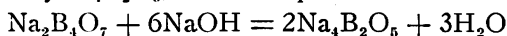
*ON THE RESTRAINT OF DEVELOPMENT BY BORAX AND CERTAIN SIMILAR SALTS —E. R. BULLOCK

IT has long been known that the addition of borax, sodium bicarbonate, or ordinary sodium phosphate to a developer produces, under certain circumstances, an apparent restraint of development. The effect is especially pronounced when the developer is one containing an organic developing agent of relatively low reduction potential (such as hydroquinone or pyrogallol), a caustic alkali (soda or potash), and considerable bromide. Lüppo-Cramer has dealt with the subject in several papers which appeared in the *Photographische Korrespondenz* in 1915; and the greater number of the experiments there described have been repeated by the writer on lantern plates, in connection with the sepia toning of these by direct development. The results obtained confirmed those secured previously by Lüppo-Cramer. Lüppo-Cramer explained the restraining effect produced by the addition of borax and similar salts to the developer as being due to the low solubility of the silver salts corresponding to the substances in question which influences the amount of free silver in solution. He has pointed out further that sulphates, acetates, and tartrates do not give the effect, the solubility of the corresponding silver salts being too considerable. And an experiment which he made with sodium salicylate (as an example of a salt of an acid whose silver salt is only difficultly soluble) showed that this salt gives typically the borax effect. A study of the various silver salts of low solubility arranged in order of insolubility shows, however, that there are no great anomalies in the actions of oxalates and succinates, which do not give the borax effect, and fall between the carbonates and salicylates, which do give it. Moreover, it is difficult to explain how any salt like borax or sodium phosphate, where the supposed corresponding silver salt has a solubility many times greater than that of silver bromide or even

* Communication No. 127 from the Research Laboratory of the Eastman Kodak Company.

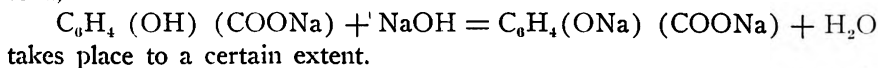
silver chloride can have any detectable restraining action of the same nature as that exerted by an ordinary soluble bromide. There are, indeed, restrainers of the bromide type, those of practical importance being potassium iodide and potassium bromide for silver bromide and silver bromide emulsions, and potassium iodide, potassium bromide, potassium ferrocyanide and sodium chloride for silver chlor-bromide and silver chloride emulsions, and it is usual to restrict the name "restrainer" to such salts as these.

But the velocity of ordinary photographic development is not dependent only on the maximum concentration of silver which is possible in the developer. It is dependent also on the alkalinity, and in regard to the alkalinity of solutions, the actual facts are not always exactly as might be supposed. It might be supposed that a substance which is alkaline when dissolved in pure water will, when dissolved in a solution which is already alkaline, increase the alkalinity of the latter. An example will show, however, that as regards the active alkalinity, this is not invariably the case. Both caustic soda and sodium bicarbonate are alkaline. Caustic soda is very alkaline. Sodium bicarbonate on the other hand is only very slightly alkaline. If, however, the caustic soda and the sodium bicarbonate are both dissolved in the water, or if the caustic soda is dissolved in the sodium bicarbonate, or vice versa, the alkalinity of the solution is identical with that of a corresponding sodium carbonate solution and is very much less alkaline than the caustic soda itself. In other words, a neutralization of about nine-tenths of the active alkalinity of the caustic soda solution has been brought about by the addition of a substance which itself gives a feebly alkaline solution when dissolved alone in pure water. It is very obvious that the result of an addition of sodium bicarbonate to a developer which has been made up with caustic soda is a reduction in alkalinity and consequently a restraining action. And a similar explanation is applicable to borax and to each of the other salts which show the borax effect; for in every case the salt added is the potentially acid salt of a somewhat feebly dissociated acid and, while itself alkaline in reaction, nevertheless forms with caustic soda a normal salt the alkalinity of which is very much less than the mean of the respective alkalinities of the original salt and caustic soda. In the case of borax itself we have a potentially acid salt of a weak acid, for the ortho acid of boron containing two atoms of boron in its molecule has the composition $(\text{OH})_2\text{-B-O-B-}(\text{OH})_2$, or empirically $\text{H}_4\text{B}_2\text{O}_6$, and the equation



expresses the formation of its normal sodium salt.

Sodium salicylate, $\text{C}_6\text{H}_4(\text{OH})(\text{COONa})$, can be considered an acid salt inasmuch as it still contains replaceable hydrogen and the reaction with caustic soda,



From the foregoing remarks, it will be gathered that alkalinity is composite in nature. While it is only the active alkalinity (hydroxylion concentration) which counts when the speed of development at any given amount is considered,

the other component, which is called the reserve alkalinity, is of some importance as determining the resistance of the developer to diminution of its active alkalinity with use. Without entering into the theory of this effect, it may be simply stated that, if the active alkalinity and other conditions are the same, the greater the reserve alkalinity of a developer, the more uniform its action may be expected to be and the longer its useful life. In ordinary photographic practice, indeed, the alkali most commonly used is sodium carbonate, which already possesses considerable reserve alkalinity, and caustic soda or potash (with scarcely any reserve alkalinity) is ordinarily used only when speed is of importance.

CONCLUSIONS

1. The borax effect—the retardation of the speed of development under certain conditions, shown by borax and certain other sodium salts—cannot in any degree be attributed, as has been suggested by Lüppo-Cramer, to the low solubility of the corresponding silver salts.

2. The borax effect is due to the diminution of the active alkalinity of a developing solution which occurs in consequence of a chemical reaction between the borax or similar salt and the alkali already present in the solution.

CONTROL IN BROMIDE PRINTING

IT is too much to expect, in any photographic printing medium, a perfect accommodation in rendition of any desired scale of gradation to express adequately the personal equation. In the bromide process of positive printing, however, we have an elastic method and an opportunity of considerable presentation of relative values in the print.

A bromide is really an analogue of a sensitive gelatine plate. Hence, it possesses pretty much the same latitude. A comparison of it with other printing methods shows where the advantage lies.

The other methods are almost entirely dependent on a gradation scale produced solely by light action, and hence fixed and practically unalterable in the ratio gradation.

The development, too, of these media is also, in a great measure, merely contingent upon exposure, but with bromide the development may be operated to vary widely the ratio of scale gradation under personal control.

The pictorialist should get thoroughly acquainted with the extent of possibilities of his printing medium and study how to modify results by chemical means—to produce at will emphasis *here* or the necessary repression *there* in the picture during the evolution of the image.

The emulsion of a bromide paper consists essentially of the same silver bromide which is spread upon the glass of the plate. It might be accounted a very slow ordinary plate, and like such a plate is possessed of a full, rich scale of gradation.

The length of the scale of gradation of bromide paper is much greater than in any chloride paper.

The intensity of the image on bromide paper may be controlled in the following ways by exposure, by alteration of the distance from light (artificial light) during exposure, the character of the illumination, intensity and color of the artificial light, development, intensification, reduction, toning, nature and character of the paper basis.

A glossy paper gives the longest scale. "Matt" paper is softer and less tendency to contrasts and though the ratio of gradation is somewhat less than the glossy variety, the general values are well preserved.

The quality of the negative, of course, has influence on gradation in a developing paper the same as with printing-out mediums, but the bromide worker has this advantage—he is considerably more independent of the character of the negative than the worker with P. O. P., for he has the opportunity of altering the gradation before, during or after the development within a very considerable range.

But the worker with bromide dare not presume upon his privilege or carry things beyond the range of the paper if he wants to keep the tones true.

He can compensate, to be sure, by after treatment in the way of intensification, and so extend the scale, but the scale is best had between the prescribed limits.

If we have, for instance, a negative which expresses the range of gradation identical with the range of the bromide paper, if the print is correctly exposed we find that a pure, black shadow is obtained with just a visible image in the highest light when the print is fully developed; that is, developed to the limit. But if we have a negative in which the gradation range is beyond the bromide paper range of registration with full development of the paper exposed we shall have rusty blacks when the highest lights have been developed out; and if the negative range is shorter than the paper's range we get weak grey-black shadows when the highest lights have been reached. That is with development to the limit. But with bromide paper we can control gradation with any negative of any gradation scales by the exposure.

Find, by trial strips, the exposure required to just print through the highest light of the negative for development to the limit.

Where the negative has a scale of gradation beyond what the bromide can render, the exposure necessary to produce a visible image in the highest light is more than sufficient to produce the rich black in the shadows, with the result that they are decomposed. Now the object is to control the print during development, or develop it to a degree that it may be subsequently corrected by intensification.

To utilize this power of control of gradation, where the negative is not such as to directly afford it in the printing, it is essential that the bromide be exposed considerably beyond what is accounted normal exposure (overtimed) and that the development be stopped before it reaches the limits. It is the shadows which we must study during development; they are the parts we control, and to do this they must be kept well within the limits the developer can carry them to by the time the highest lights come up.



PAULINE FREDERICK

NED VAN BUREN

The amount of overexposure, of course, depends upon the negative scale.

The image should be developed by a weak developer (dilute developer) without increment of potassium bromide until the whole scale of gradation is visible, but being fully exposed, such a state of image is amenable to the action of bromide of potassium or to the influence of a further modified developer.

In this way it is possible to compare the condition of the shadows with the high lights.

Under the action of the secondary agents (the modified developer), as soon as the highest light detail is visible, continue development until the shadows are of the required intensity—but as the overexposure necessarily tends to give intensity in the high lights not wished for, we must depress action there during the evolution of the shadows, and this may be effected by use of the potassium bromide. Sometimes a liberal dose of bromide is demanded.

For first developer one ounce of normally constituted developer to fifteen of water is about right. For the modified developer one ounce normal developing solution to four of water, to which one-half grain of bromide of potassium should be added.

Developing in the weak solution must be continued until the whole scale of gradation is visible, and then it is, perhaps, best to use one of the hard type of agents like hydroquinone, but never let the temperature of the de-



"CRACK O' DOOM"

F. J. MORTIMER, F.R.P.S.

veloper sink below 70 degrees, because with hard agents the deposit at lower temperatures is not pleasing. Stop development when the highest lights are sufficiently expressed.

The first development on general principles had better be done with one of the softer types of developing reagents, like metol or eikonogen, and the second development either with hydroquinone alone or with an addition of it to the soft developer. The effects by control after fixation need not here be touched upon further than to say that such methods are found most valuable means of improvement and for further expression of the artistic personal equation.

Bromide printing lends itself to the pictorialist and allows him to secure, by legitimate chemical means, beautiful results and puts the worker beyond the province of guessing at exposure and trusting to amelioration of initial bad product by sepia toning.

The photographer can get directly what his taste dictates in the original beautiful black tone of the bromide paper, and if his taste does run to the *real sepia*, which there is no gainsaying is often beautiful, he may better attain his end by the initial carefully made and rich in gradation bromide.

CARBON PRINTING FOR BEGINNERS—J. B.

CARBON prints of all the indirect methods of positive pictures best interpret the virtues of a good negative. Other methods by contact printing or by development show some falling off in the range of gradation exhibited in the negative from which they result.

The following remarks upon the process are intended for those not acquainted with the manipulation and so special features are described so as to give not merely the necessary instruction in working, but also definite information regarding the results obtainable and the manner in which they may differ from those had by other methods of printing.

In one respect, at least, carbon printing is unique, the wide range of color possible with it.

To the uninitiated the process looks complicated, whereas, in fact, it is exceedingly simple.

The apparent difficulty arises from the fact that the method of working is so essentially different from all the other printing methods.

As soon as the worker gets familiar with the manipulation, progress is certain.

The absence of a visible image is at first a little perplexing, but this is soon surmounted and errors in judgment avoided.

Before proceeding further it may be well to understand what carbon tissue is.

Just think for the time being that you have in your hand a piece of paper coated with gelatine, into which has been thoroughly incorporated some coloring

matter (pigment). Now, this gelatine sheet is sensitized with potassium bichromate, which, on exposed to the light, forms an insoluble compound.

If the bichromated gelatine had not been submitted to the action of the light, it would still be in a condition which would cause it to dissolve in warm water, and all the bichromate would wash out and we would have everything washed off and nothing left but the paper. Now, it is plain to see that having placed a piece of this bichromated gelatine under a negative and exposed it to the light it will remain soluble in parts and insoluble in others. Now, let us make application.

First of all the tissue must be sensitized in a solution made up as follows:

Potassium bichromate	3 ounces
Ammonia	½ ounce
Water	100 ounces

During prevalence of hot weather the quantity of the bichromate should be a trifle less. About 100 grains of salicylic acid and two ounces of alcohol may be advantageously added.

If the tissue is found to be rolled very tight, one end may be placed in the solution and rolled up, and at the same time unrolling the other end, and so, back and forth, until the tissue is just about limp: it is then placed face down upon a piece of glass, and the excess of the sensitizing solution removed by a squeegee. It is now hung up to dry in a dark-room where there is a current of dry air.

If there is danger of moisture in the air a little calcium chloride should be placed in a saucer in the drying room.

It is well to do the sensitizing the night before, so that the tissue will be dry by morning.

Another way is to place the tissue immediately from the sensitizing solution, face down on a sheet of glass which has been first thoroughly cleaned and then rubbed over with French chalk. The tissue is squeegeed on the glass and left to dry. When dry it comes off of its own accord or with a little persuasion with the blade of a penknife. The tissue thus presents a glossy, smooth surface and is conveniently handled. The glass disappears with the development.

Having cut the tissue to the desired size, we will proceed with the double transfer process.

First, you must have a safety edge around the negative. Each edge must have a strip of opaque paper pasted around it, so as to prevent the tissue from printing to the extreme edge; the idea is to keep the edge of the tissue soluble, thereby giving it a start in developing which will be explained further on.

Of course, this looks like some little trouble and you could use if you prefer an extra piece of glass the same size as the negative used around the edge of which is pasted the safety strips.

The tissue, thoroughly dry, is placed in the frame with the gelatine side to the negative and exposed to the light. As we said, there is no visible image,

so we cannot watch the progress of the printing as with P. O. P., so we must judge some other way how long to print.

This is the part of the process which deters some from the undertaking. Correct judging is made very easy by the use of a photometer, of which there are several kinds, one as good as the other, but it is best to keep to the use of the one and not change about.

About as good a plan as any is to make an ordinary print on any printing-out paper from an average negative and judge from the amount of exposure with it of what is necessary for the carbon. A little guessing at first, but you soon hit the right time.

Having had the correct exposure, the tissue is next placed in cool water until it is just about limp. It is then gently brushed over the face and back so as to get rid of any air bubbles which form.

Just before the tissue is about to curl, film up, start to remove it and place it on the temporary support which previously has been soaked in cool water for an hour, until the water running from its waxed surface no longer shows a greasy appearance. The temporary support may be had from the dealer. It is, however, merely a heavy paper coated with a hardened gelatine. It may be repeatedly used but every time it must be freshly waxed.

A. Benzole	4 ounces
Beeswax	2 drams
B. Turpentine	4 ounces
Rosin	6 drams

The print, having been soaked and placed film side down on the waxed surface of the temporary support, is covered with a piece of rubber cloth and squeegeed; it is then hung up, or better, placed between blotters and left for half an hour or so, after which development may begin.

The tissue, by this time attached to the support, is placed in a tray of warm water (90°), the temperature is now gradually raised by adding hot water or by heat beneath the tray.

In a little while the coloring matter will begin to ooze out from under the tissue.

Now take the original by one corner and gradually lift from the temporary support, being careful during the operation to keep the temporary support (which now supports the tissue) below the surface of the water.

Thus far the operation should be done under yellow light. You will now see before you a mass of slimy coloring matter which should be laved off with the warm water, thereby accelerating the development.

In a short time the soluble gelatine will wash out and the print begin to show up.

It must be borne in mind that the warmer the water is and the longer the development is allowed to proceed, the lighter the print will get.

It is obvious then that it is not advisable to begin the development with the



"MISS VANITY"

V. BLACKBURN

water too hot, not only because of the danger of encountering blisters, but also because you lose advantage of control.

For instance, should you make a mistake in judging the exposure and think it full or even overtimed, you commence developing with hot water, and then you discover your mistake that you really had undertimed and so the print is spoiled.

But had you started with moderately warm water you can by carefully handling bring the print out all right.

After the print has been developed it is rinsed off in cold water and placed in a saturated solution of chrome alum until the yellow color, caused by the bichromate is entirely removed. It is then washed and may be finally transferred although it is better to allow the print to first dry on the temporary support and then rewet and transfer it.

The final transfer paper is soaked in cold water until limp, then placed for a minute in lukewarm water, then placed coated side down on the print, which also has been soaked until limp; the rubber cloth is placed over all and the squeegee again applied; then it is hung up to dry. The print will separate from the temporary support and remain on the final support.

The object of the double transfer is to have the picture correct as the original. The single transfer makes a reversed print which sometimes is not objectionable.

The operation up to and including the printing is exactly the same as for the double transfer process.

The tissue having been exposed, is soaked in cool water and placed directly on the single transfer paper, developed, washed and fixed in the chrome alum, washed and hung up to dry.

This process is very simple, indeed, and it is good practice to make some prints by it before trying the double transfer.

PRINTING UPON SILK WITH THE SALTS OF SILVER AND IRON

THE making of prints upon silk or linen and upon several kinds of canvas usually involves the previous preparation of some salting compound, and after-sensitizing with a solution of nitrate of silver. The sensitizing of fabrics with platinum is an exception.

The process described by A. J. Jarman differs in so far that the material to be sensitized requires no previous salting or the employment of gelatine, gum or starch; the preparation is ready for use just as soon as it has cooled down. The application to silk can be made with a good camel's-hair brush or a piece of swansdown calico tied over a two-inch-wide strip of glass, with the fluffy side outward, or, if neither of these is at hand, a tuft of absorbent cotton can be used for the even distribution of the sensitizing material. One important condition is that, when the sensitizing of the silk has taken place, the

drying should be hastened; rapid drying will cause the image to become more clear and brilliant.

The sensitizing mixture is prepared as follows. The mixing is best done in a wide-mouthed, amber-colored glass bottle away from actinic light.

No. 1

Ammonio-citrate of iron (green)	1 oz.
Distilled water	8 oz.

No. 2

Citric acid (crystals)	1 oz.
Hot distilled water	4 oz.

No. 3

Silver nitrate	1 oz.
Hot distilled water	4 oz.

No. 2 is added to No. 1, they are well shaken, No. 3 is added, and the bottle is again shaken vigorously. As soon as the mixture is cold it will be ready for use.

To sensitize the silk, it is put down upon a clean sheet of celluloid or a clean sheet of glass, taking care that no metal comes into contact with the liquid, and the surface of the silk is brushed over carefully with the mixture, using a camel's-hair brush or the swansdown calico as described. As soon as the surface is evenly coated, the top corners may be clipped with a shellac varnished wooden photographic clip, and the sheet suspended in a dry, warm room away from white light until quite dry. A number of pieces may be sensitized, and, when dry, placed in a printing frame with a sheet of clean glass, and kept under pressure until required for use.

The negative is put in an ordinary printing frame. If it is a film, a piece of clean glass is placed in the frame and the film put upon this. If it is desired to vignette a portrait, the arrangement must be made up and tested beforehand upon a piece of P. O. P.; in any case, the prepared face of the silk is placed down upon the negative and exposed in a good light until the image appears well in a good brown color.

As soon as the printing is complete the pieces must be well washed in clean cold water half a dozen times, or more, to extract all traces of the sensitizer. It may then be fixed in a weak solution of sodium hyposulphite. Fixing is usually complete in about ten minutes. The silk must then be well washed in cold water half a dozen times, then in hot water, then rinsed well, dried and ironed out with an ordinary flatiron; if ironed upon both sides the image will be found to come up well, taking care to iron the face upon which the print has been made last. The print can be washed several times in warm water previous to ironing without fear of injury.

Silk of various colors can be used and arranged for framing, or made into pin cushions, or bound with a suitable silk cord and suspended upon the wall, or made into cushions. Silk stool tops can also be made in this way.

It must be mentioned here that there are two kinds of ammonio-citrate of iron, the brown and the green. If the brown salt is used and the keeping qual-

ities of the material are affected, the green variety may be tried, as this possesses better keeping qualities.

The use of ammonio-citrate of iron as a photographic compound was first discovered by Sir John Herschel in 1845, and there have been very many photographic preparations made with it, particularly the blueprint paper which has become a daily article of trade. The production of photographic prints in various forms has also been made with the compounds of silver nitrate and the ammonio-citrate and ammonio-tartarate of iron. In all these preparations the resultant image is of a rich sepia or brown.

Although silk only has been mentioned in this article, linen can also be used. If linen is used, the article or piece of fabric should be well washed with soap and water after the fixing and washing operations, previous to ironing. If the silk is submitted to the same operation, no harm will accrue; the main point to be attended to in the use of salts of silver and iron is to be sure that the fixing operation and thorough washing are carried out as perfectly as possible. If this is attended to, there need be no fear of want of permanence in any of the prints so made.

ARTISTIC RELIEF

WHEN we employ our eyes and attentively look at things in Nature, the phenomenon presented of the continual receding of parts, which is often spoken of as the natural perspective, is so common to us that it never forms a matter for our consideration, nor arrests, in any way, our attention until we come to examine a scene or object upon a flat surface, like the painter's canvas or the mounted photographic reproduction.

Here is a limitation put upon the artist. He has a thing of two dimensions only—length and breadth—but he must so fill this rectangle that he conveys to our mind, through our vision, the suggestion of the third dimension of things—depth or solidity.

This feat contributes one of the greatest features of attractiveness in a work of art, because by the painter's skill all the appearance of want of relief is successfully overcome and the very deception or illusion is gratefully received by our mental vision.

It is the knowledge of this fact and the efforts of the pictorialists in photography to vie with the painter which has given rise to the discussion, continually progressing, about the influence of focus as a means of expression of artistic relief or space relation of things.

The mathematical lens gives linear perspective and differentiation of planes, but what is the influence of varying definition in the planes upon the character of the picture? How shall the lens be manipulated to make things not only extend in a plane parallel to the eyes, but also extend toward us or from us, and as one object after another is added to those constituting the scene, how shall the recession, as it were, to great lengths of miles from our point of sight be shown?

There are two things upon which the artistic relies mainly to bring about the suggestion of recession. The one perspective, which is really the show of a diminution in the size of objects under optical presentation, the other, the effect produced by intervention of atmosphere between the receding passages—*aerial perspective*.

Now the painter has recourse to certain methods of handling, by which he deludes the eye into a belief that it is looking through air, but the only need of the photographer in getting the effect of retirement is in the management of the focus in securing the appearance of natural haze with its attendant obscurity. And here is his nice point for attack of the problem, he must control the atmospheric effect so as to get the right degree of recession.

He cannot, like the painter, change at will, bringing in more here and clearing away there, diffusing or sharpening the effect as his taste sees fit to secure the natural expression.

There is a continual complication in this matter of effect of recession between studio photography and that of open landscape.

In the former much more may be often conveyed by alteration of the focus than in the latter, because the effect of blur of focus is much greater in looking at an object a few feet away from the vision than is the case in a comprehensive view out-of-doors. Therefore, the act of vision is better accommodated by the circumstance.

In the case of groups and what are known as picturesque foreground bits, wherever the whole subject pertains mainly to things close to the camera, the atmosphere can have little or no influence, and a blurring or out of focusing of background may do much in the way of accentuation of what is the principal feature.

But when the background features are very marked in light and dark areas, or where the areas vie in size and form with the principal features, such blurring by unaccentuated focus cannot be indulged in, for the general effect of the picture would be interfered with.

Some painters give relief by finishing the figures highly and painting whatever may form the background, even when somewhat close up, in a blurred manner. But these backgrounds are chosen with a view that they shall not vie too much with the figure subject.

Backgrounds so treated; that is, out of focus, must be of such a character as to be looked on only as a background setting, not for its intrinsic beauty; for whenever any of the things in the background assume sufficient importance to be any way attractive or prominent part in the picture, it becomes necessary to accentuate the focus sufficiently to let the eye know what they represent, or the vision will worry about them.

The value of atmospheric perspective ought to engage attention more than it does. The problem is not solved by mere racking the lens out of focus, but then, fortunately, there are some of the best in the profession who are working in the true artistic way.

OUR FRIEND, THE ENEMY, "HYPO"

SIR WILLIAM HERSCHEL made modern photography possible by his discovery of "hypo"—as we call it—as a fixing agent; but the name it has ever since borne, an abbreviation for sodium hyposulphite, is a misnomer; it is not a hyposulphite of sodium, but the sodium salt of thiosulphuric acid—sodium thiosulphate.

Thiosulphuric acid is connected closely to sulphurous acid, on the one hand, and to sulphuric acid on the other, and in consequence "hypo" and the other thiosulphates are nearly related to the sulphites and the sulphates.

Oxygen, or an oxidizing agent, when brought into contact with sulphurous acid or a sulphite, causes a more or less rapid combination to take place, and the sulphurous acid is converted into sulphuric acid, and the sulphite into a sulphate.

Likewise, when under certain circumstances, sulphur or a sulphuretting agent comes into contact with a sulphite or sulphurous acid, they combine forming a thiosulphate or thiosulphuric acid.

A sulphite contains one molecule of sulphur to three of oxygen. A sulphate one of sulphur to four of oxygen.

The corresponding thiosulphate two of sulphur to three of oxygen. These differences in composition necessarily produce differences in the properties of both the acids and the salts.

The sulphates have but little inclination to decompose, but the thiosulphates, with the exception of our hypo, are very difficult to keep intact, decomposing under ordinary conditions of temperature, etc.

Hypo, if strictly pure, and most, if not all, the hypo dispensed to photographers is pure, and in the crystalline state (not in solution) and perfectly dry, is reasonably stable. But hypo—sodium thiosulphate in solution—is unstable.

The addition of a small quantity of acid (sulphurous excepted) to dissolved hypo sets up decomposition in it, and we note a milkiness or opalescence of the liquid by the precipitation of sulphur in a very fine state of division almost in a colloidal state—the thiosulphuric acid is set free and it in turn splits up into sulphurous acid and sulphur.

The more concentrated the solution, and the higher the temperature, the greater the decomposition. If the quantity of acid added, however, is very small, according to M. Reeb, sulphuretted hydrogen is also liberated.

If the sodium hyposulphite is in excess this presence of sulphuretted hydrogen and sulphurous acid and of a sulphate, too, is easily explained.

Nascent hyposulphurous acid in the presence of an excess of hypo forms an acid sodium hyposulphite which decomposes, yielding sodium sulphate, sulphuretted hydrogen, sulphurous acid and sulphur, but the complication is worse still, for the reaction does not stop here, the sulphurous acid liberated attacks the sulphuretted hydrogen, yielding pentathronic acid, and the pentathronic acid in its turn acts upon the hypo forming sodium pentathronate and hyposulphurous acid, which, in its turn, decomposes into sulphuretted hydrogen, and the sul-

phuretted hydrogen with excess of hypo slowly acts upon the latter, forming sodium sulphide, sodium bi-sulphite and sulphur; so you see what a commotion is excited by the addition of acid to hypo.

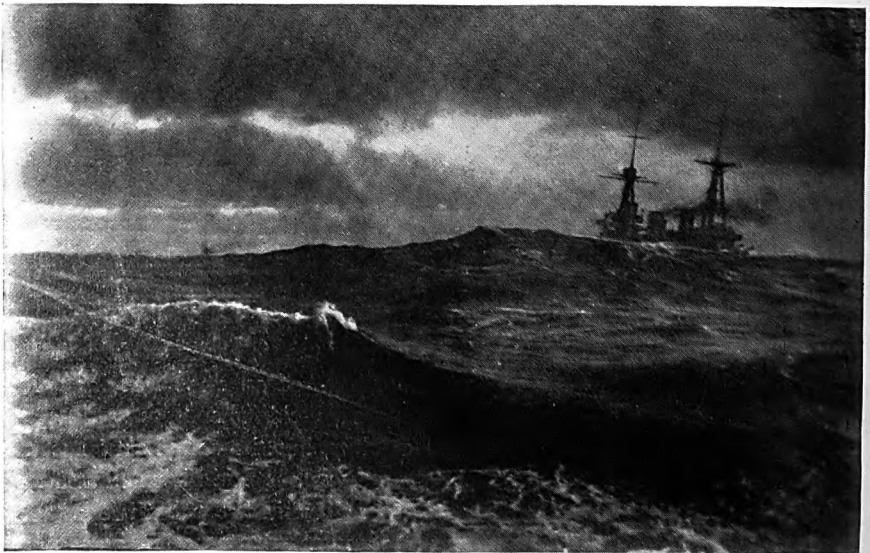
But there is a considerable difference between the employment of sulphurous acid and the use of sodium bi-sulphite, which not only does not decompose the hypo, but actually prevents its decomposition by dilute acids, and even by strong acids in the cold state, preventing the formation of sulphuretted hydrogen.

Alum is one of the constituents of the acid fixing bath. Its reaction in the cold solution causes a decomposition yielding sodium sulphate and aluminum hyposulphite. This latter is very unstable, but the addition of sodium bi-sulphite hinders considerably the reaction of alum on the hypo. So, also, does neutral sodium sulphite, as pointed out by Lanier.

Therefore, it is recommended in the employing of alum in the making of the fixing bath an addition should be made of sodium bi-sulphite equal to one-fifth of the content of alum.

The following conclusions may be drawn from these facts relative to hypo-fixing.

1. The action of a small quantity of acid to excess of hypo produces immediately a salt corresponding to the acid employed—sulphurous acid, sulphuretted hydrogen and sulphur.
2. The secondary reactions which take place result in the formation of sodium bi-sulphite, acid sodium sulphide and sodium pentathionate.
3. The addition of sodium bi-sulphite does not decompose the hypo.
4. Alum decomposes hypo, but a small amount of sodium bi-sulphite prevents this decomposition.



"THE VIGIL"

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Laws and Rules

It is a general notion that genius places its possessor above the observance of rules. If such a notion had any solid foundation in fact, it would operate powerfully against the value of instruction, particularly in matters of taste. Besides, it would be a sop administered to indolence and an encouragement to self-conceit.

It is to genius that the world is indebted for the discovery of what are called the laws of Nature, and it is only to genius that we can turn to further enlarge our horizon of knowledge, and it stands to reason that genius will work for future discoveries in the line of law it has discovered.

Therefore, we may premise that genius is not lawless, but rather most obedient in the observance of laws or general principles. There is, however, a great difference between the laws and the rules of Art.

It is true that a great artist may seem to be unconstrained; that is, to have peculiar qualities not exercised by inferior minds—eccentricities, if you will—but on analysis it is found that all is in conformity to law founded in Nature and allied to her highest beauties—"the light that leads astray is light from heaven."

So we may reasonably conclude that all the laws of Art are traceable to Nature, but that the rules of Art, accumulated in the practice of the schools, may be occasionally of value, but are far from being of such importance as to demand invariable obedience. "There are some rules," says Reynolds, "whose absolute authority, like those of our nurses, continues no longer than while we are in a state of childhood or pupillage."

For instance, there is a rule of extensive application in the management of light and shade, that one should oppose a light ground to the shadow side of a figure and a dark ground to the light side; but all of us photographers, as well as painters, have found that a fine effect is had by exactly the contrary conduct—by joining light to light and dark to dark. Now, this is just what happens in Nature; lights with lights and shadows with shadows are often noticed to be in unity as well as in opposition.

A well-known rule, and one rarely departed from, requires that in a composition of more than two or three figures, one or more should present their backs to the spectators, to avoid a theatrical or artificial look. Yet this rule is frequently violated with good effect, as is in evidence in the great painting of "The Last Supper," by Da Vinci.

The same subject was painted before Leonardo's time by Giotto and Raphael, and afterward by Titian and Poussin and other masters of more or less note, and in all their works we have figures introduced turning their backs on the spectator; yet it is conceded that Da Vinci's group is the greatest.

Doctor Johnson says, "There are three distinct kinds of judges upon all new authors or productions; the first are those who know rules, but pronounce judgment entirely from their natural taste or feelings; the second are those who know and judge by rules, and the third are those who know, but are above the rules. These last are those the painter or author should desire to satisfy. Next to them are to be placed the natural judges—but those are to be disregarded for critical ability whose opinions are formed only by rules."

The man of taste or ideas, without discounting forms and regulations, knows when to break through them in obedience to great principles, though we confess he is frequently open to the criticism of the stickler for formalism.

Art is only advanced by observance of its laws and the intelligent use of its rules. The laws are few in number, the rules many and constantly increasing in number, so that the student is apt to be perplexed by the various dogmas, often contradictory or apparently so. No doubt many valuable things are thus learned, but the difficulty is to distinguish between precepts founded in truth and the many that are merely empirical.

One safeguard against deception is to be-

ware of all rules which promise easy acquirement of art, and to mistrust our own dexterity when we find any rule a labor-saving means of dispensing with personal effort.

One thing we ought not to forget, and that is that the rules of Art should not so dominate our actions as to make their strenuous influence palpably perceptible in our work; for Art is always the more perfect in the degree in which its impressions are made by means which do not court conspicuous notice.

Shadow and Detail

The photographer, when desirous of reproducing colored objects of Nature (and all Nature is really in color), finds himself limited in the scale of gradation presented in his monochrome transcript.

Monochrome, therefore, is the only means of giving photographic impression of objects. The photographer must make the highest light in his subject correspond to the white surface of his paper print and the deepest shadow to the darkest tint of his chemical body producing his pigment.

Inasmuch as the scale of gradation in the object, from highest brilliancy to densest obscurity, is greater than can be possibly represented in the paper, we are obliged to compromise—that is, to modify the presentation of the natural scale—to give an idea of the original in the copy.

Something must needs be left out or slighted in the copy, and the question is, how shall this omission be effected without falsifying in the reproduction?

Whenever the eye rapidly surveys anything it is impressed primarily with the general form and mass, the contrast of light with dark. When we look at a landscape we see only the principal salient objects with any degree of distinctness, and, consequently, with impression of more detail than the less-pronounced things.

This peculiarity of the vision is the basis of the strong contention of the impressionists. Impressionism met with much opposition and was subjected to much ridicule, some of which it merited, when its votaries carried it to unreasonable extremes, but it did yeoman service in art by opening our vision to many beauties of Nature not before regarded.

We know that impressionism also became a cult in photographic art, and most of us are wearied with the discussion as to its art value in photography; but we

can say that photographic art has been benefited by its invasion, and we can afford to overlook some of its absurdities.

Impressionism, in the main, has much to support it as an esthetic truth. It may be easily verified that the eye dwells on the subject, whether it be a portrait or a landscape, the vision gradually perceives more and more of the details which were unobserved by a momentary impression. Now, the pertinent consideration for the photographer is the possession of some idea, how much of the detail ought to be represented to give the true impression of the object.

How shall the impression be made forceable? How shall the appearance of flatness from over-elaboration of detail be prevented?

Let us suppose we are about to photograph two pieces of drapery in a good, strong illumination. One piece is of a rough texture, while the other is smooth. Let us first examine the objects with half-closed eyes, so as to exclude small variations. What do we notice in the objects? It will be observed that the shadows of both look smooth, but that the lights, especially the half-lights, show differences in each object. These half-lights are called, for want of a better name, "half-tones," and they are those which give the characteristics to the objects. Hence, it follows, to give characteristic representation of different objects, we must study the means of presenting in the copy the phenomena of the half-tones. It is just in the rendering of these half-tones which determines the good or bad character of the picture.

So artists have come to the conclusion that if any sacrifice is to be made for securing artistic effect, anything else is better spared than these half-tones. The depression of detail in the shadows to the degree of keeping the shadows transparent or luminous is what the good painter aims for.

Now, the photographer finds that it is especially difficult to secure this luminousness of shadow when he is compelled to work upon what is called "matte" or dull-surface papers. He must have recourse to encaustic pastes and gums and varnishes to lighten up and enrich the dull shadows.

There are, however, certain photographic printing processes, such as carbon, which do give luminous shadows without after-manipulation.

In the carbon print the layer increases in thickness according to the depth of the shade.

We all know that in printing from a rich negative, say, on platinum paper or other matte-surface papers, the shadows are apt to come out dull and opaque. The appearance of the print is improved by using a paper with a rough surface, because by this means a kind of texture and transparency is introduced into the shadows, much in the same way as the water-color artist secures transparency.

Black as a color is harder to deal with in the shadows. Browns and sepias and reds give advantage over black, because the full depth of the color may be employed. We still imagine something darker in tone, and so such shadows never look flat. To get the subordination of detail demanded for effective work some photographers have recourse to blurring, or, as some call it, smudging; but it is more consistent with artistic rules to suppress detail by means of the initial illumination of the original. To get this legitimate suppression one should employ the full opening of the lens in exposure, and so control our scheme of lighting that the shadows may not too obtrusively set forth the minutiae.

The Color of the Light from the Night Sky *

BY LORD RAYLEIGH, F.R.S.

The general light of the sky at night is very faint, and beyond the observations of Campbell (*Astr. Soc. Pacific*, 1917, xxix., 218) and Slipher (*Astr. Jour.*, 1919, xlix., 266), who could always detect the aurora spectrum line in temperate latitudes, nothing appears to be known of its spectroscopic or chromatic character. Slipher, indeed, suggested that the invariability in its brightness recorded by Yntema might be accounted for by attributing the light mainly to a variable aurora. But this view has been controverted, rightly as I think, by Fabry (*Astr. Jour.*, 1919, l., 308). My own observations, now to be recorded, indicate that at the time and place where I was working, little, if any, of the light could be attributed to the green aurora line.

The great difficulty of spectroscopic observations is, of course, the want of light; though if the light were monochromatic, as, for instance, if it were all concentrated in the aurora line, this difficulty would be much mitigated. I thought it worth while, however, to try if anything could be learnt

by a cruder method, which possesses some advantages even if the light is not very feeble.

A series of small colored filters were arranged so as each to transmit a limited portion of the spectrum. These were placed in a suitable frame, which held in addition a neutral-tinted photometric wedge of carbon in gelatine, made by Mr. Sanger-Shepherd. This wedge was graduated in equal parts, according to Hunter and Driffeld's method. (Scale-reading 10, light transmitted = $1/10$; scale reading 20, light transmitted = $1/100$.) A photographic plate was placed in the frame, so that part of it was under the various color filters, and another part under the wedge. This could be exposed to the night sky or other source of light.

After development, the photographic intensity under each colored screen will match the intensity under some point on the wedge. The plate, therefore, gives a record of what fraction of the total photographic effect due to the source is transmitted by each screen. For comparable results with different sources of light, it is of course necessary to keep to the same kind of photographic plate.

The great advantage of the method is that it allows light to be used from a cone of very large angular aperture. With a spectroscope we cannot, under the most favorable circumstance, use an aperture ratio of more than 1:2. But a plate under the colored filters may be exposed to the entire hemisphere if desired. Moreover, when faint impressions are concerned, a large patch of defined shape and uniform, even if small, intensity practically gives much more confidence to the experimenter than a small and faint spectrum. The information given is, of course, of a rather different kind.

Coming now to details. The colored screens were:

1. Ultra-violet glass, supplied by Messrs. Chance 3300-3800
2. Cobalt blue glass. Several thicknesses 4000-4500
3. Bluish-green glass 4300-5300
4. Green glass 5100-5900
5. Flavazine 5500-7000
6. Flavazine, with didymium glass $\left\{ \begin{array}{l} 5500-5630 \\ \text{and} \\ 5930-7000 \end{array} \right.$
7. Wratten's red filter, No. 23A 5800-7000

These were chosen, so far as possible, to give nearly the same photographic density

* Reprinted from the Proceedings of the Royal Society, A. Vol. xcix.

with sunlight. This is desirable, because the range of intensities which the plate can deal with is not unlimited. The green and red filters, which transmit portions of the spectrum to which the plate is comparatively insensitive, were chosen to give as large transmission as was consistent with isolating a fairly narrow range of the spectrum.

Filter No. 6 was designed to isolate as nearly as possible the green aurora line, if present. No filter could be found to cut out the red without at the same time involving serious loss of green.

Ilford special rapid panchromatic plates were used. These were far more effective in the red, yellow, and green regions than any other plates I have tried. All the results recorded were obtained with a consignment of plates bearing the same number, and therefore, presumably, as nearly alike as may be.

An ink mark on the under face of the wedge gave a fiducial mark on the negative, and starting from this, the wedge scale was copied by hand on to the developed film, marking it on with a fine pen.

The photometric work on the developed plates was done with the photoelectric apparatus described in connection with the scattering of light by gases (Proc. Roy. Soc., 1920, xcvi., 440). Briefly, it depends on a photoelectric cell with battery and galvanometer. The plate rests on a table, in which is a slit. Above is a bright light focused on the slit with a lens. The rays diverging beyond the focus fall on the photoelectric cell. The deflection of the galvanometer depends on the opacity of the photographic film. The impression through a color filter was placed on the slit, film downwards, and the deflection noted. The impression of the wedge was then substituted, with the length of the slit at right angles to the length of the wedge. The plate was then slid along until the previous deflection was recovered, and the position of the slit on the wedge scale noted.

On a given negative, the result was usually recovered to within about 0.2 of a scale division, but, with another negative, discrepancies as large as 1 scale division (representing a factor of 1.26), or even more, were observed. These are due either to inequalities in the photographic film or to changes in the quality of light received from the source, due to varying atmospheric conditions (see the remarks in my paper, loc. cit., p. 442. The plates used in

the present work were coated on common glass, not plate glass).

The photoelectric measurement of a given negative was very satisfactory, and far preferable to visual photometry. (The latter can, no doubt, be applied to smaller areas on the negative, which is important in some investigations.)

The first series of experiments was made with the plate exposed to the entire sky, so far as it was not blocked out by trees and buildings. This method is open to the objection that some of the rays pass very obliquely through the colored screens, with the result that the effective thickness of the latter becomes somewhat indefinite. This, however, does not seem to vitiate the result appreciably, as subsequent experience showed; while an important advantage is gained in shortening the exposure.

Comparison of the night sky with the clear twilight sky (Table I) shows clearly how much poorer the latter is in yellow and red light. The wedge readings for the two yellow and the red filter differ by about 4 scale divisions, showing that, for the night sky, the yellow and red components account for 2.5 times as large a percentage of the whole photographic effect as in the twilight sky.

TABLE I.

The Figures given are the Wedge Readings, obtained as described.

Ultra-violet glass	10.6	10.0	9.9
Cobalt glass	13.1	13.3	12.4
Bluish-green	12.5	12.2	11.3
Green	14.7	13.7	16.1
Flavazine	8.5	8.0	13.1
Flavazine with didymium	12.1	10.9	16.1
Red	10.7	10.0	15.0

The next series of experiments were designed to include in the comparison the direct light of the sun and moon. These give approximately parallel rays, which traverse the absorbing screens normally. For comparison with them, it is desirable to restrict the cone of rays from the night (or day) sky as far as other conditions will allow. An aperture, 15 inches in diameter, was placed 15 inches from the plate. This aperture was the smallest that could well be used. The work was carried out in August and September and early October, when the hours of complete darkness are very limited. Summer time imposes a further obstacle. The moon must be below the horizon, and the night should be clear. With the aperture ratio 1:1, as described, about nine hours' exposure were needed to give satisfactory intensity.

Two plates with this exposure were all I could get before my enforced return to London in October. The exposures were made at Beaufront Castle, three miles from Hexham, Northumberland, and also at Terling Place, Essex. There was no appreciable interference from town light, diffused by the sky.

In making exposures to direct sunlight, the difficulty was to reduce the photographic effect sufficiently. The ideal method would be to use a pinhole camera, giving an image of the sun which would cover the quarter plate used, but this involves an impractically long camera. To work at a reasonable distance, more divergence of the rays is essential. It was got by means of a quartz lens, of 7 mm. diameter and 9 mm. focus. The

noticed in the first place that the wedge readings for cobalt glass and bluish-green glass respectively are nearly the same whatever the source of light. This merely expresses the fact that by far the greater part of the photographic effect of the spectrum is due to the kind of light which these glasses can transmit. In any case, the ultra-violet or red ends of the spectrum produce a comparatively small fraction of the whole effect, consequently the absence or presence of these constituents hardly affects the wedge reading for the blue.

It is in the case of the ultra-violet at one end of the spectrum and the yellow and red at the other that enough variability is to be expected to give information as to the constitution of the source.

TABLE II.

	Starlight sky.			Blue sky at sunset.		Blue sky. Sept. 24, 1 p.m.
	Sept. 15-16.	Oct. 8, 9, 10.	Mean.	Sept. 27.	Sept. 28.	
Ultra-violet glass	13.2	11.9	12.6	12.3	15.4	10.4
Cobalt glass	14.9	14.8	14.8	13.5	12.8	14.0
Bluish-green	11.8	12.3	12.0	11.9	13.3	12.8
Green	13.5	14.7	14.1	16.3	17.2	17.6
Flavazine	8.5	8.5	8.5	12.9	15.1	13.9
Flavazine with didymium	11.5	11.6	11.0	16.6	17.0	18.0
Red	9.9	11.9	10.9	14.3	16.2	16.3
	Sun, 33° up.			Moon, Sept. 26, 33° up.	Basalt, fresh.	
	Sept. 22.	Sept. 28.	Sept. 28.		Basalt, weathered.	
Ultra-violet glass	14.9	15.8	14.9	14.9	14.9	16.2
Cobalt glass	14.3	15.2	14.6	15.2	15.0	15.6
Bluish-green	11.7	12.9	13.2	11.4	12.0	11.3
Green	13.2	14.1	15.5	14.0	14.2	13.1
Flavazine	7.0	8.0	8.8	7.5	7.4	7.8
Flavazine with didymium	10.7	11.0	12.2	11.3	10.7	10.6
Red	9.0	10.8	11.5	9.5	8.7	9.3

plate was placed on the axis of the lens, at about 60 cm. distance, when the divergent cone of rays from the image covered an area more than large enough. The lens was mounted in the end of a blackened box, with a Kodak photographic shutter over it. The plate holder, carrying the colored screens and photometric wedge, was introduced at the other end of the box. A simple shadow arrangement was provided for pointing the axis of the lens at the sun.

A quartz lens was used, so as to avoid any absorption of ultra-violet light, or any risk of introducing color which might disturb the comparison of sunlight with other sources.

Exposures were also made on direct moonlight. For these, no special arrangements were needed, as an exposure of several seconds proved suitable.

The results are given in Table II.

In considering these results, it will be

The ultra-violet constituent tends to be variable for plates obtained on different occasions. This is not surprising when we consider that this constituent is largely affected by atmospheric absorption, and is therefore sensitive to atmospheric conditions, even when the sky is apparently clear. For the same reason this constituent will be largely affected by the altitude of the source. Thus the sun and moon, both exposed to a 33° altitude, are at a disadvantage compared with the zenith sky.

For these reasons not much can be inferred from the ultra-violet data. It is noteworthy, however, that the zenith sky seems much richer in this constituent when the sun is high, than at sunset. This may be accounted for by atmospheric absorption of the rays from the low sun before they reach the observer's zenith, and are scattered towards him by the air.

The great superiority of the night sky

over the day sky in yellow and red light is again apparent, amounting as before to about 4 scale divisions (a factor of 2.5).

The night sky also differs very little in quality from direct sunlight. It is only in the ultra-violet that any definite distinction is apparent, and as already remarked, the zenith sky would have an advantage in this region on account of less atmospheric absorption.

No definite distinction can be made from these experiments between the chromatic constitution of sunlight and that of moonlight. The numbers found are same within the limits of experimental error.

We may say therefore that the night sky is found to be of the same color as direct sunlight or moonlight, but much yellower than the clear day sky.

What we can see of the moon's surface suggests that it consists of volcanic rock, and the light is, of course, diffusely reflected sunlight. It occurred to me, in connection with the present experiments, to include in the comparison sunlight diffused from specimens of terrestrial volcanic rock. These exposures were made when the sun was 33° up, so that atmospheric absorption should be as nearly as possible the same as when the moonlight exposures were made. The photographic plate was placed in the box used for exposures to direct sunlight, but the quartz lens was removed. The iris diaphragm attached to the shutter was adjusted so as to subtend half a degree at the photographic plate—the same angular diameter as the moon—and it was backed with the specimen of rock in full sunlight placed near the aperture. The same exposure was given as was given to direct moonlight. Only two exposures were made, one to a specimen of fresh basalt, and another to a weathered ochreous surface of the same. The light from the fresh basalt cannot be distinguished definitely in quality from moonlight or sunlight, but the light from the weathered basalt appears to be distinctly yellower than moonlight. The experiments are too few for a final conclusion, but they suggest that the surface of the moon is more like the fresh than the weathered specimen. This is in accordance with the absence of a lunar atmosphere. (These experiments on rock were hampered by the fact that the photometric apparatus was not at hand when the exposures were made. They are merely of a preliminary character.)

VISUAL OBSERVATIONS ON THE NIGHT SKY.

The conclusions reached, photographically,

on the night sky are entirely confirmed by visual observation.

The photometric comparison of lights of different colors is, under ordinary circumstances, difficult and embarrassing, and little definite significance attaches to the results. But with lights below a certain intensity this difficulty disappears, since there is no longer the power of color discrimination, and vision is monochromatic. A confident decision can then be given as to which of two lights appears brighter, whether they are of the same spectral quality or not. This is, of course, well known, and is fully elaborated in works on color vision.

Two gelatine films on glass were prepared, one dyed yellow with flavazine, and the other with methylene blue, the intensity of the latter being adjusted by washing out some of the color until right for getting the effects which will now be described. The two films were mounted edge to edge at the end of a pasteboard tube, so that, when the tube was directed to the sky, the circular field was seen divided into two along a diameter.

During the daytime the yellow film was considered by all observers to be the brighter. As twilight advanced, the Purkinje phenomenon came into evidence, and the blue film became brighter. This remained the case when the light had waned so far that the color sensation had disappeared. As the stars came out, the predominance became less marked, and, before the Milky Way was distinguished, there was equality. Finally, when the Milky Way was conspicuous, the yellow film was notably brighter, whether the tube was pointed to the Milky Way or to other parts of the sky.

Another pair of films was prepared, giving equal intensities when the night sky was viewed. In this case, still more than in the previous one, the blue half appeared brighter while any twilight remained. (A preliminary notice of this result was published in a letter to *Nature*, dated August 20, 1920.)

It was desired to confirm visually the conclusion reached by photography that the color of the night sky was nearly the same as that of direct sunlight or moonlight. Moonlight was chosen, as being of more convenient intensity. It was found that the yellow and blue films, which appeared equally bright against the night sky, also appeared equally bright when viewed against a white cloth exposed to direct moonlight.

This background was, however, somewhat too bright, and, in order to get rid of color perception, it was found advisable to reduce it twelvefold by means of Fox Talbot's revolving sector. It was then impossible to distinguish between the two colored films, which appeared of exactly equal intensity.

The night sky was examined on many occasions through the pair of films, which gave equal brightness. I never observed any marked deviation from equality, at considerable altitudes, though low down the yellow often had an advantage. This is probably attributable to selective atmospheric absorption. The experiments gave no evidence of a variable color such as might be produced by an aurora of variable intensity.

I may add that my own attempts to see or photograph the aurora line on ordinary nights have had no success. All that I could see was a continuous spectrum. Note added, March 4.—I have since succeeded in regularly photographing the aurora line.

To get the information as to the chromatic character of the light from the sky at night, photographic exposures were made under colored media selected for isolating various parts of the spectrum. By comparing the photographic densities obtained, it was concluded that the night sky was much yellower or less blue than the (clear) day sky. Comparison with direct sunlight or moonlight showed that the night sky was of the same quality as these.

Visual comparisons through colored films showed that a blue film, which was equally bright with a yellow one against the night sky, was brighter against the twilight sky. These comparisons were not embarrassed by color differences, because the light was so faint as to give purely monochromatic vision. The two films matched one another equally well, whether they were seen against the Milky Way or against other parts of the sky. In the photographic work no special attention was paid to this point, the exposures being made to a considerable area of sky around the zenith. The diurnal motion, of course, brought successive areas of the sky into action during the long exposures.

One theory of the light of the night sky attributes it to sunlight scattered by a very rare gaseous atmosphere, situated so high up as to be outside the earth's shadow. The present observations are contradictory of this theory, which would require the night sky to have the same color as the day sky.

The comparative absence of polarization

(see Rayleigh, *Astr. Jour.*, 1919, 1, 227; also Babcock, *ibid.*, p. 228) leads to the same conclusion.

The requirements, as regards color and polarization of the light, would be satisfied if we regarded it as coming from an unresolved background of stars. They would equally be satisfied if we regarded it as due to sunlight scattered by meteoric matter. The conclusions of van Rhyn (*Astro. Phys. Jour.*, 1919, 1, 356) favor the latter alternative. He regards the general light of the sky as an extension of zodiacal light.

Photographing Fungi

Dr. Ludwig Klein, of Karlsruhe, has given in a botanical journal some suggestions in the matter of photographing the common forms of fungi; that is, those known commonly as mushrooms. An abstract of the essay is given in the *Photographische Rundschau*, from which some of the more important points are taken. Fungi are quite perishable organisms. Many of them are minute and their photography can be carried out only with the aid of the microscope, but this phase of the question is not here considered. The large fungi cannot be preserved with much success, at least, for purposes of identification in the case of closely allied species, hence photography of them when fresh is of considerable value. Photographs in natural colors are especially striking. As most fungi grow in somewhat shaded places, time exposures are usually only possible, and the best results are obtained with small diaphragm openings. Under-exposure is generally the danger, and over-exposure can often be corrected in the development, particularly when making transparencies. The necessity for small diaphragm opening arises principally from the fact that the camera must be quite near the object and the finer details must be secured in the picture. Focusing with a hand lens is advisable. Klein advises the use of small piece of printed matter placed in the center of the object, drawing the focus so as to make the inscription perfectly clear on the ground-glass, not forgetting to remove this indicator before exposing the plate. An over-cast sky, or at least absence of direct sunlight is indispensable. Scattered sunlight in the locality is especially objectionable. Inasmuch as the movements of the sun cannot be controlled, and the long exposures are liable to include an alternation of light and shadow, it is recommended to place

the camera so that the operator stands between it and the sun, and thus can interpose his body to throw a shadow on the whole arrangement. Klein has often used an umbrella placed at a moderate distance from the object, a procedure which has given excellent results with brilliantly colored specimens, especially if the umbrella is placed somewhat oblique so that an unequal lighting is obtained. A group of fungi showing young and matured specimens at one time is of course most desirable, but such groups are not by any means easy to find. It is possible to make up a group by hunting among a number, but it must be remembered that the tissue of these plants is mostly quite fragile, and care must be taken in transplanting them. The lower part of the stem is often an important matter in differentiating certain species and the posing should be such as to show this clearly. The attachments by which the camera can be fastened at any angle will be found generally more convenient than the tripod. High inclination of the camera is to be avoided, as this will give too great expression to the background. Klein says that he often places the camera on the ground and focuses lying prone. (The reflex attachments for cameras will probably be of much use in this work; also the expedient of using a small sheet of mirror glass held at the proper angle back of the ground-glass.) Some method should be used to record and indicate the actual size of each object. Quarter plates are suitable and a shutter that can be opened and closed without disturbing the apparatus is necessary, for among other advantages a change in the lighting or the development of a breeze can be met by closing the shutter until the condition passes.

The exposure in the case of white or very light fungi is about one-half that for the darker species. Yellow specimens require plates sensitive to yellow and the use of a yellow screen. Working in an ordinary forest, with diaphragm f60 and clear sky, 5 minutes in the middle of the day will be the time; in the open with the shadow of the operator over the object as noted above, 3 minutes will suffice. From these data the exposures for less brilliantly illuminated objects can be determined. In very dull weather, the diaphragm may be opened two or three times further than noted.

The coloring of the transparencies is described at some length, but this is a question of artistic manipulation which need not be here considered.

Study Shadow Effects

It is surprising what a difference in expression is produced by the character of the shadows cast upon the face.

As we recently passed through the corridor of the Municipal Building, we noticed that the faces of the Caryatides, near the main entrance, had almost a look of animation, as if transfigured. Many a time before they had seemed to us to have nothing but a stony stare, but now they looked human, as if possessed by thought and feeling. And all this effect was produced simply by the particular character of the shadows caused by the illumination at the time.

When the eye is quite uncultivated, we see man as man and a face is a face, and nothing more; we do not take into account the shadows and lights falling upon it. But as our artistic taste gets cultivated to some degree, we begin to notice the shadows more distinctly, but it is only the more vigorous ones. Further cultivation lets us see light within light and shadow within shadow. Now, we begin to make a study earnestly of all faces, and appreciate the subtleties of light and shade until the practice becomes almost a possession, and our attention is centered on gradations which, to an untrained faculty, are partly matters of indifference or imperceptible.

The perception of light within light and shadow within shadow is what constitutes education with the portraitist, and there is no branch of Art affording greater study than portraiture.

To the portrait photographer such study is imperative, and he neglects his opportunity when he does not avail himself of the benefit of direction or study from such works as one recently issued by the editor of the BULLETIN OF PHOTOGRAPHY; that is, Burnett's "Study of Composition in Art."

Carefully select the best situation in your studio adapted to the character of illumination you desire, and, having an educated eye, try to bring out the best points in the head, losing what is not essential or which militates with the effect in the shadows, keeping the general effect well in sight, still do not lose sight of the tender variety of lights within lights and shade within shade.

Be assured that if you do not habitually accustom yourself to look for these subtle gradations and use all your skill in exposure to secure them in the negative, your work has no right to lay claim to art.

Pyrocatechin as a Developer

An editorial in a recent issue of *Photographische Rundschau* revives interest in this substance, which is now but little used by photographers. It is closely related in chemical composition to hydroquinone, and was introduced immediately after that substance, in 1888, but did not get much attention for several years, when through the researches of Lumière, E. Vogel and G. Tobias, working formulas for it were furnished. The earlier experiences were not always satisfactory, but this was doubtless due in many cases to the use of impure material, as the purification of coal-tar products was, in those days, a somewhat difficult task. At present a good quality of the substance is available, and its properties seem to justify investigation by photographers.

The first formulas, in which sodium carbonate was used, were not satisfactory, but much better results were obtained by the substitution of caustic potash (potassium hydroxide). Such a solution keeps better than similar one containing hydroquinone, and is less sensitive to a low temperature. The following formula is advised:

A.		
Pyrocatechin	5	gr.
Sodium sulphite (dry)	12.5	gr.
Water	250	cc.

B.		
Sodium phosphate	47	gr.
Sodium hydroxide	5	gr.
Water	250	cc.

For use take equal parts of each solution and of water. The mixture of sodium phosphate and sodium hydroxide is intended to produce a tribasic sodium phosphate; the phosphate directed in the formula is the form which is sold in the drug stores, being Na_2HPO_4 , plus water of crystallization. Tribasic phosphate is now a commercial article, although as a special chemical, somewhat expensive, but if it should become of much use in photography it could be furnished at a reasonable rate. Tribasic sodium phosphate has been recently recommended by Lumière and Seyewetz in the formula for combined developing and fixing. (See *PHOTOGRAPHIC JOURNAL OF AMERICA* for March, 1921.)

It is claimed that the above developer gives clear plates without hardness, in spite of which advantages it has not found general use. On the other hand, a formula with sodium hydroxide has been quite popular, as follows:

A.		
Sodium sulphite (dry)	12.5	gr.
Water	250	cc.
Pyrocatechin	5	gr.

B.		
Sodium hydroxide	3.5	gr.
Water	250	cc.

For use, take one volume of each solution and 2 to 3 volumes of water. This formula was first published in *Photographische Mittheilungen*, in 1899, by E. Vogel.

A highly concentrated solution may be prepared as follows:

Pyrocatechin	20	gr.
Sodium sulphite (dry)	50	gr.
Sodium hydroxide	14	gr.
Potassium bromide	2	gr.
Water	400	cc.

For use, dilute with from 10 to 15 volumes of water.

P. Hanneke suggested a formula, apparently but little noticed, in which no sulphite is used. A 2 per cent. solution of pyrocatechin and a 20 per cent. solution of potassium hydroxide are prepared and equal volumes mixed as required. The mixture, of course, soon spoils, but it will keep all right for the time of the development. Weisermel has also published a sulphite-free formula: 4.5 grams of pyrocatechin are placed in a dropping bottle holding 20 cc., and in a similar bottle of 30 cc. capacity, 5.5 grams of sodium hydroxide are placed. Both vessels are filled to the mark with water. For the development of an ordinary quarter plate, 5 to 6 drops of each solution are mixed in 40 cc. of water. With this solution, which is at first faintly green and slowly becomes brown, development is begun. (The brown solution does not stain the fingers.) According to the course of the development, the action is restrained or accelerated by changing the composition of the solution. If under-exposure is indicated, 5 to 10 drops of the pyrocatechin solution are added, and, similarly, some of the alkaline solution if over-exposure has occurred. The alkaline solution keeps indefinitely, but the container should be kept closed. The pyrocatechin solution slowly browns when kept in filled vials, but it remains efficient as long as it is not black and turbid. Normally developed negatives have an agreeable brown tint, but if excess of the pyrocatechin is used the tone is greenish. Prints are quickly made. In using developers without sulphite, over-exposure should be avoided as far as possible. The development, however, may be pushed

pretty far without fogging. It is claimed that the developer hardens the gelatin film somewhat. Hübl found that pyrocatechin is one of the most rapid developers.

Interest in this developer has also been aroused in France. A recent issue of *Photo-Revue* contains an abstract of a communication by Mr. Flescher to the Stereo Club of Paris, in which formulas practically identical with some of those given above are strongly recommended. It is also stated that sodium carbonate may be substituted for the tribasic phosphate in the proportion of 36 parts of the former for 80 parts of the latter. For tank development the following formula is recommended by the French author:

A.

Pyrocatechin	10 gr.
Water	250 cc.

B.

Tribasic sodium phosphate ...	40 gr.
Water	250 cc.

For use take 60 cc. of each solution and dilute to 1,000 cc. Allow the development to continue 1 hour.

A New Photographic Method of Rendering the Solidity of Objects in Space (Photo-Stereo-Synthesis)

F. F. RENWICK, A.C.G.I., F.I.C., F.R.P.S.

Monsieur Louis Lumière, to whom photographic science and practice are already deeply indebted for several epoch-making inventions, chief among which may be mentioned the practical realization of kinematography and the invention of the famous Autochrome color plate, has recently worked out an entirely novel method of obtaining photographic reproductions of solid objects which gives remarkably lifelike impressions of relief. Hitherto the only satisfactory method of doing this was by the aid of the stereoscopic camera and stereoscope. Monsieur Lumière's new method is unlikely to become popular, but is undoubtedly very ingenious, and possesses great scientific interest, so that the striking example of his work which the Scientific and Technical Group Committee has been able to obtain from Monsieur Lumière for display at the Society's forthcoming exhibition will be sure to excite attention both of members and of the general public. The fact that the specimen so kindly lent us is a portrait of the Postmaster-General, Mr. Kellaway, taken on the occasion of his visit to the Lyons Fair, will also doubtless add to the interest of the exhibit.

The means by which these pictures are made was described in a communication to the French Academy of Sciences in November last, and published in the *Comptes Rendus* (clxxi., 891), and a translation of this paper appeared in the *British Journal of Photography* for February 25th last (lviii., 110), so that it is unnecessary to describe the method in detail. The principle of the method, however, consists in the taking of a succession of photographs with a special camera, whose lens and plate-holder are both kept moving during each exposure. The motion of the sensitive plate is so adjusted to that of the lens that the images of all objects in one particular plane remain stationary on the sensitive plate, while the unsharp images of objects in other planes, before or behind this, move to a greater or less extent, and so fail to produce a recognizable image on the plate. The lens is first sharply focused and exposure made on the part of the object nearest the camera, and then, before each succeeding exposure, the camera is moved bodily forward on rails so as to bring into sharp focus a somewhat deeper plane of the object, till the whole thickness of it has been dealt with.

In practice, Monsieur Lumière has used 18 x 24 cm. plates, and produces bust portraits half lifesize. The lens is carried by a star-shaped panel, and is given a circular motion of 8 cm. diameter by the revolution of four cranks and spindles when driven by the simple belt and pulley arrangement. Somewhat longer cranks at the back of the camera carry the plate-holder, which is revolved in a circle of 12 cm. diameter by the same means.

In the case of a half-size portrait like that of Mr. Kellaway, Monsieur Lumière finds that six successive exposures suffice to give a satisfactory rendering of solidity.

From these negatives six very thin positives are made and arranged one behind another in a grooved frame in proper order and correctly spaced in accordance with the advances made by the camera between the successive exposures. A diffusing glass behind the assemblage of positives serves to produce even illumination from a lamp at the back of the whole.

To view the picture properly, it is necessary to stand straight in front of it and to direct the gaze normally to the surface from a distance of several feet. In addition to the method by which this and other similar portraits have been produced, Monsieur Lumière has also described another most in-

teresting means by which these striking effects of solid relief could be produced. This second method, which is also described in the original paper referred to, is remarkably interesting for the reason that it foreshadows the possibility of producing full-scale copies of maps, drawings, or other plane surfaces of any size with a small lens. Owing to the fact that sufficiently accurately made Porro prisms were not available, Monsieur Lumière failed to get satisfactory results by this method, but it is to be hoped that one or other of our skilled optical instrument makers will undertake their production and open up the new possibilities which the idea appears to offer.—Photographic Journal of the R. P. S.

Preparation of Plates for Ultra-Violet Light

Photography offers the only satisfactory method for recording the phenomena of ultra-violet and infra-red light, inasmuch as these rays are invisible to the unaided eye. It is fortunate, indeed, that the ordinary silver salts are sensitive over so wide a range. It is true that many of the invisible rays can be observed by means of a fluorescent screen, but this does not furnish a permanent record. Research has shown a wide range of both forms of rays, and one serious interference with investigations is that ordinary glass is practically opaque to all vibrations above the violet, so that resort must be made to quartz, flintspar and other substances, either rare or difficult to obtain in clear condition. The recent inventions, however, by which quartz can be cast in the form of clear plates and tubes will be of advantage in these researches. In a recent issue of the *Journal de Physique*, Duclaux and Jeantet describe a method of treating ordinary plates so as to increase greatly the sensitiveness to the higher vibrations. They had need of plates sensitive beyond 1900 Angström, and tried the procedure advocated by Schumann, but found it tedious and uncertain. Schumann plates are distinguished by the small proportion of gelatin, and it was thought that this condition could be secured by degelatinizing to a great extent ordinary plates. Trials of various methods, such as immersion in warm water, acid solution, digestive enzymes were without success, but a simple and satisfactory procedure was devised.

The plate is placed horizontally in a dish with dilute sulphuric acid (1 volume of the strong acid to 10 volumes of water), and kept for four hours at room temperature

(about 77° F.), the temperature being a little higher than this at the beginning and a little lower at the end. They are then removed to a dish in which they are washed by a very slow current of water, as the remaining gelatin is tender. Thirty minutes will be a sufficient washing. They are then dried, which requires but little time on account of the small amount of gelatin present. Plates thus treated retain a thin layer of emulsion poor in gelatin and uniformly spread on the glass. This deposit is extremely sensitive to ultra-violet rays, but is also very fragile, and the authors recommend that, before developing, the surface should be coated with a thin film of collodion, the plate being immersed in the developing bath before the collodion is quite dry. Although most commercial plates are adapted fairly well for this procedure, it is likely that trial with many forms will show some more suitable than others. For rays of much greater wave-length than above noted, these plates are ten times more sensitive than the best plates prepared according to Schumann's method, and at least two hundred times as sensitive as the plate in its commercial form.

Another method for obtaining plates of high sensitiveness to short wave lengths is by covering the emulsion with a layer of fluorescent substance. Such a substance absorbs, so to speak, the short waves and emits in turn waves of greater length, to which the gelatin is transparent, and thus permits an action on the silver compound, hence the impression is made as if the gelatin was not present. For this method, substances giving blue or violet fluorescence should be chosen, and they should be dissolved in a liquid that will not swell the gelatin, and is not absorbed by it, since the efficiency of the process depends on the fact that the fluorescent medium acts before the light enters the gelatin film. Water is, therefore, not applicable. The authors obtained good results with a solution of esculin in glycerol, but found most satisfactory results with lubricating oil. Many of the commercial forms of these have a distinct fluorescent due to hydrocarbons. It is sufficient to smear a few drops of such an oil over the emulsion by means of a wad of cotton. After exposure this film should be removed by means of ether or alcohol. A very thin fluorescent layer may be obtained by immersing the plate for a few minutes in a solution of the fluorescent oil in light petroleum or alcohol, and allowing the solvent to evaporate. These procedures are simple

and effective. They enable the operator to secure photographs of rays ranging from the extreme red to the limit of the ultra-violet. One slight defect is noted, a very small enlargement of the rays by irradiation, but this does not go beyond the twentieth of a millimeter. The processes have been tried with many commercial plates, and the sensibility is found to be greater than with the sulphuric acid method. It is possible, indeed, to carry out an instantaneous spectrography. Detailed results with certain metallic spectra are given in the paper.

Camera and Character

In an article appearing under this heading in the "Oldham Chronicle," the writer says: Mankind is a mine inexhaustible, and the exploration of that mine always yields some profit to the photographer, be he seeker after beauty, or student of men and women. A photograph is much more to the man taken than to the taker. Accordingly, a wise man destroys many plates, for a broken plate may save a broken friendship. Photography is an absorbing pursuit, but if it costs you a friend you have paid too dear for your whistle. With the bold lovers of truth, those who like Cromwell want the wart on the nose, there is no difficulty. They know that little mannerism is a bad one; they know that trait which the camera reveals is in the character, and don't mind acknowledging it. The average man and woman want a "nice" picture, and put niceness ahead of truth. It is a bit of that self-deception with which most of us go through life, a light cloak that a gust of truth blows aside, but which does well enough in fair weather. Thus in photography, as in other pursuits, the moment we touch human beings we enter into the realm of moralities. No photographer can ignore it. And as a building arises out of many bricks, so out of his numberless observations a fine structure of solid knowledge is erected. If the proper study of man is mankind, no one can surpass the photographer in opportunities for such study. A sitter sometimes shows more of himself in five minutes than in five hours. In those minutes a short study may be made which reveals the essential, the often unseen bases of character. The face may be all that goes to the plate, but the sitter's mind often goes into that mental portrait gallery which the man with the camera is forming, for though he began with the sole notion of becoming a photographer he ends by becoming one who knows—in short a philosopher.—*British Journal of Photography*.

The Toronto Exhibition

J. ADDISON REID

A great photographic exhibition is interesting not only in respect of the intrinsic merits of the pictures displayed, but also as it reflects the progress and development of the Art, indicates in what parts of the world it is flourishing and the processes which are most popular with the artists in achieving their results.

The Canadian National Exhibition, in connection with which was held the thirtieth annual exhibition of The Toronto Camera Club, has run its allotted course of two weeks, during which 1,242,000 people paid admission to the grounds. What proportion of these the Exhibition of Photography it is impossible to say definitely, but it would be safe to estimate that there were not less than 125,000. The Graphic Arts Building, in which the show was held, occupies one of the most commanding positions in the grounds and is a building that few exhibition visitors fail to enter. Mr. W. A. Alcock, of the Brooklyn Institute of Arts and Sciences, who visited the show on the opening day, expressed his conviction that more people see the pictures at The Toronto Camera Club's annual exhibition than at any other photographic exhibition in the world.

This is the third year in which The Toronto Camera Club's annual exhibition has been held in connection with Canada's great annual fair and this year difficulties which were previously encountered in arranging an effective display of the pictures in a building not especially well designed for the hanging of small prints were almost entirely overcome, so that, although the Club has been able to hang more prints at some previous exhibitions, at no other have they been displayed to such good advantage. The photographs occupied about one-quarter of the space in the Graphic Arts Building, which was given over entirely to Photography, Drawing and Painting, although the main exhibition of paintings was held in the Art Gallery, which is a separate building. The photographs were undoubtedly one of the chief attractions of this year's fair. One of the Sunday papers at the end of the first week gave the front page of its illustrated section to reproductions from the photographs, while its comic artist had an amusing sketch on the front page of the magazine section depicting a visitor gazing wonderingly at the picture "Freedom," by Mr. Frederick Archer, of the Camera Pictorialists of Los Angeles.

Although not as many countries were represented in the list of exhibitors as at some previous exhibitions, the show was nevertheless a fairly cosmopolitan one. Besides Canada, the United States, Great Britain, Holland and Norway were represented. After the judges had made their selection of prints for hanging they had the ungrateful task of rejecting many of the selected prints because there was not sufficient wall space on which to hang them all. The catalogue, while in general appearance equal to the standard of the past two years, was unfortunately marred by a few typographical errors; but, as Toronto has been in the throes of a printers' strike for some months past, it was with great difficulty that it was produced at all.

There were 210 prints hung, the work of 98 exhibitors, 18 of whom were from Canada with 37 prints to their credit. The United States, as usual, led with 61 exhibitors and 135 prints. Great Britain came next with 15 exhibitors and 29 prints; Holland had 3 with 6 prints, and Norway 1 with 3. Among the American exhibitors California again took the lead, but the Brooklyn Institute was represented by 16 exhibitors and 26 prints, being the most largely represented of any single organization except the Toronto Camera Club.

The Toronto Camera Club endeavors to make its exhibitions as largely educational as possible and for some years past has asked its exhibitors to indicate on their entry forms opposite each entry the printing process used in making the picture. This information is given in the catalogue and two pages are devoted to brief descriptions of the various printing processes. This information was not given in the case of 40 of the prints hung in this exhibition, but bromide, as might be expected, was the favorite process among the remaining 170, 96 of which were bromide prints. There were 32 chloride prints; but the most noteworthy feature of the exhibition in this connection was the popularity of the bromoil process. There were 26 bromoil prints, every country exhibiting except Norway sending bromoils. Of the remainder, 6 were gums, 5 carbons and 5 platins, all of the platins coming from the Brooklyn Institute.

The photographs were displaying in two adjoining rooms in one wing of the building, a small room and a large one. In the large room the pictures were hung in three rows around the four walls with the portraits forming the top row, there being just enough of these to work out evenly. This gave the portraits a distinctive grouping and added much to the effectiveness of the display. Across the floor of the large room and in front of the large main entrance archway stood a big screen which held fifteen prints on each side. Thirty-

nine prints were hung in the smaller adjoining room, being arranged in two rows around the four walls.

An innovation undertaken this year was a display of lantern slides, which added greatly to the popular interest in the exhibition. It was felt that this would be too much of an experiment to justify the Club in asking generally for entries in this class and accordingly the lantern slides were selected from the work of the Club's own members. They were displayed by means of an automatic projecting machine on a sheet of ground-glass some 18 inches square, giving a brilliant image both by day and night and without the dimming of lights in the room. On the whole this feature was a success, although the machine required frequent attention when the carriers showed a tendency to jam. This could not fairly be laid to the fault of the machine, which was designed for the American size of slide, while the slides used by the Club are the square or English size, for which the carriers had to be adapted, preventing them from running as smoothly as the regular type. One autochrom slide was ruined by the gelatine melting and running, while minor accidents happened to some of the others. This feature will probably be tried out at least one more year before a general invitation will be issued to submit slides.

The artistic quality of the work hung this year was very high. It was probably because of the fact that the general average was higher than no particularly outstanding work was to be observed, as was the case in several previous exhibitions. Pictorial photography in Canada, to judge by these annual exhibitions, is largely confined to The Toronto Camera Club. The explanation of this undoubtedly is that for thirty years, through their annual exhibitions, the members have had the opportunity of studying the best work produced in all parts of the world. There were two exhibitors and two prints from the Y. M. C. A. Camera Club, Winnipeg, in this exhibition, the artists being Messrs. W. D. Moore and F. H. Rodgers. All the other Canadians were members of The Toronto Camera Club. Among the portraits were two by A. S. Goss, Secretary of the 1919 exhibition, the subjects being visiting celebrities, Mr. John Drinkwater and Mr. Cyril Scott. A portrait of Bliss Carman, the poet, by M. O. Hammond, was a very strong piece of work. The most effective group of pictures by a Toronto artist were five prints by A. R. Blackburn, Vice-President of the Club. All of them, but especially one, "Stately Elms," were the result of skillful and extensive work on negative, transparency and enlarged negative. The hand work, although obvious, was not noticeable at ordinary viewing range.

The portraits were the strongest contri-

bution from the British artists. The portrait of J. Ramsay Macdonald and of the "Lady With Striped Scarf" were the features of one wall, both of these being by Hugo Van Wadenoyen, Jr., F.R.P.S. Four prints by Lionel Wood, F.R.P.S., of The Camera Club, London, formed a strong group on another wall, while a nude by the same artist, "The Spirit of the Downs," was perhaps the most successful work of this kind in the exhibition. It shows a single female figure, a dancing sprite in a wide expanse of misty dawn. She is undoubtedly there, but the artist has achieved an elusive and ethereal quality in the figure which quite justifies his title. E. J. Mowlam, of the Portsmouth Camera Club, had three pictures of the sea, at least two of which are suggestive of Mortimer's work at its best.

The Pictorial Photographers of America were represented by seven of their members. Dr. Chaffee's picture, "Porlock 'As You Come to the Ship Inn,'" being chosen for one of the catalogue reproductions. Thos. O. Sheckell had four pictures and William Gordon Shields two. The Brooklyn Institute showed the best example of teamwork, their pictures coming in a single shipment. Miss Sophie L. Lauffer's portrait "Marjorie," a high key portrait of a little girl, was singled out for admiration by many visitors. Gustav H. Seelig, of Boston, had five prints, and in this exhibition where so much first-class work had to be rejected it goes without saying that where any one man had five prints hung they were all of superlative quality. Mr. Seelig furnished perhaps the only touch of humor in the exhibition with his charming and funny table top studies. The California artists dominated the show in point of numbers, having almost one-quarter of the exhibitors and more than one-quarter of the prints. Mr. Archer's picture "Freedom," previously mentioned, incidentally, is a highly imaginative nude study. The female figure, with drooping limbs and bowed head, is about to step down from the huge stone pillar to which she has been chained. Figure, pillar and the links of the great chain are strongly silhouetted against an illuminated patch of sky; before her is utter darkness. Numerous interpretations of this picture were heard, but the present writer does not propose to hazard one.

It is an invidious task to single out for special comment the few pictures which space will permit dealing with. There were dozens of others quite as worthy, and still others with regard to which a critic could wax quite caustic. I have endeavored to do what seems much more practical within the obvious limitations here imposed, to give an idea of the general character of what has come to be one of the world's greatest annual photographic exhibitions.

On the Displacement of Solar Rays Under the Action of Gravitation

H. BUISSON AND CH. FABRY

The Theory of Relativity predicts a shifting of the rays of the solar spectrum towards the red, in comparison with the same rays emitted by artificial sources. This is due to the gravitational field of the sun. Each wave-length should be lengthened by a little more than two-millionths of its terrestrial value.

As long ago as 1896, Rowland and Jewell, at Johns Hopkins, found that there was a difference between the measured lengths of the same lines obtained in one case from the sun and in the other from the electric arc. In most instances the lengths of the solar waves were the greater, though the opposite occurred also. In 1909, the authors showed that these latter anomalies disappeared when comparisons were made with light emanating from an arc in a vacuum. At that time pressure was the sole cause known to be competent to produce a general shifting of the rays. Earlier in the present year Perot has shown that the *b* line of magnesium displays no noticeable shift due to pressure, and that the difference between its two wave-lengths according to solar or terrestrial origin agrees well with the predicted Einstein value.

The authors discuss thirty-two similar differences for as many iron lines, and conclude that they all similarly are in accord with the predicted values within the limit of experimental error. Thus, on the hypothesis that the pressure in the reversing layer of the sun is so small that it causes no shifting of the lines, it appears that the Einstein effect is competent to explain the difference between the wave-lengths of the lines derived from the sun and from earthly sources.—G. F. S., *Journal Franklin Institute*.

The Measurement of Graininess in Photographic Deposits

L. A. JONES AND N. DEISCH

Graininess is defined as "that effect of inhomogeneity exhibited by photographic deposits due to the presence of groups or clumps of silver particles." The authors distinguish three classes of graininess: (a) that due to the existence of the individual particles of silver; (b) graininess due to the clumping of these particles; and (c) graininess due to the agglomeration of the clumps. While much work has been done on the factors influencing the size of the

grain in various deposits, very little attention has been paid to graininess, which is of increasing importance, especially in view of the high relative magnification which photographic deposits undergo in modern kinematograph practice. A method has been devised of measuring the graininess of photographic deposits, and a detailed description of the apparatus is given. The method consists essentially of projecting a magnified image of the deposit on to a diffusely reflecting screen. An equally illuminated patch of neutral tint is received on the same screen, and, by means of a movable mirror attached to a scale, the distance is found at which all graininess disappears and the field appears even. The deposit is now replaced by an object exhibiting a definite geometrical pattern—in this case a commercial cross-line screen, with 500 lines to the inch, line and interspace being equal. The image of this screen, magnified as before, is focused on the diffusing screen, and the former process repeated, *i. e.*, the distance found at which the image just becomes uniform in appearance. A comparison of the two readings will give a comparison of the relative graininess of the two objects, and by the use of a simple mathematical process the irregularity of the deposit may be expressed in terms of a screen of such a number of lines per inch as would be of equivalent graininess. Full details of the process are given, with a discussion of the various safeguards adopted to avoid the personal equation, etc.; curves illustrating the influence of various developers and varying conditions during development are also given. While previous investigations have shown that the size of the reduced silver grain is almost independent of the composition of the reducer, such is not the case with graininess, and different developing agents are shown to produce very appreciably different degrees of graininess. Speed and temperature of development and presence of restrainer appear to have little effect on the production of graininess.—*Journal Royal Photo. Soc.*

Alcohol and Ammonia in Color-Sensitizing Baths

A. VON HÜBL

Pot. Chron., 1920, *Le Procédé*, 1920

A considerable number of the modern sensitizers when dissolved in water give imperfect or gummy solutions, which when filtered pass uncolored, leaving almost all the coloring matter on the filter paper. An analogous filtration is produced on the external surface of the gelatine of plates which one

tries to sensitize, producing stains on the developed image, whilst the deeper parts of the film are not reached by the dye, and therefore do not acquire sufficient color-sensitiveness. These dyes, however, give in alcohol, and in alcoholized water, correct solutions, filtering without decoloration. Alcoholic baths have besides the advantage of permitting a more rapid drying of the sensitized plates. It is recommended to employ sensitizing baths containing 30 to 50 per cent. of alcohol, or, for dyes suitable for sensitizing in pure aqueous solution, the plate can be passed through the alcohol before drying it, the images being more clear when the drying is done most quickly. An excess of alcohol is to be avoided if one wishes to obtain the completely useful effect of the dye. With pinachrome the color-sensitiveness is raised by the addition of alcohol to the bath, but with 50 per cent. alcohol the effect of the dye is almost completely annulled. Almost identical results have been obtained with ethyl red, pinaverdol, and pinachrome violet. These dyes have not otherwise any very marked tendency to separate out of their aqueous solutions. There are other red sensitizers which have been examined which act quite otherwise. With pinacyanol, pinacyanol blue, and pinachrome blue the introduction of alcohol considerably augments the sensitizing effect, the best results being obtained with a high proportion of alcohol, which is necessary also for insuring the effective solution of the dye. Alcohol is to be avoided in sensitizing with erythrosine employed alone, or associated with yellow for screens and for non-filter orthochromatic plates, as the introduction of alcohol lowers very notably the color-sensitiveness. The addition of ammonia to the sensitizing baths is frequently recommended for avoiding the decomposition of the colors by acids present in the water employed. König has already shown that a very slight addition is useless, whilst a larger amount gives trouble, tending to promote fog. The experience of the author shows that so long as the addition does not exceed one or two drops of ammonia per 100 c.c. of the bath one obtains with some dyes a very slight increase of color-sensitiveness. It is more advantageous to add borax to the sensitizing bath, in the proportion of a cubic centimetre of cold saturated solution to 100 c.c. of bath. All trace of acidity is neutralized, and the emulsion protected against the subsequent action of acids, arising, for instance, from packing papers.—*Photographic Abstracts.*

Notes from Foreign Sources

A NEW TREATMENT OF SKY AND DISTANCE. A. Jonon, technical director of a French firm, contributes to *La Revue Française de Photographie*, a note of a new method of dealing with the sky and distance problem. He refers to the fact that many a photographer has been impressed with the harmony of the foreground and the cloud tints when viewing a landscape backed by mountains, but has failed to repeat these on the plates he has exposed. The clouds have lost their tints and the mountains are obscured by haze. Two remedies have been offered for this difficulty. Since these portions of the view are over-exposed on account of their brilliancy, it has been proposed to control this, and some operators have used a shield cautiously interposed for a given time. To obtain proper value of blue and white, which have nearly equal photographic effect, a yellow screen has been employed, using with it an orthochromatic plate. These two methods are combined in screens recently devised by the firm with which the writer of the note is connected. These are cut out of glass with parallel faces, tinted with yellow so that the color diminished steadily from one point to the opposite, passing, therefore, from a distinct yellow to a colorless condition. The screen is so placed that the uncolored portion covers the foreground, the deepest part, the mountains and the sky. It is claimed that the orthochromatic properties of the plate are thus adapted to the conditions without prolonging the exposure of the foreground. Different mechanical mountings of the screen are furnished to suit somewhat different conditions. Two photogravures are given to show the advantage of the screen, and the results are certainly quite striking.

Further concerning Folio-brom. Notice was made in a recent issue of the P. J. of A., of the paper negative recently placed on the French market under the title "folio-brom." Further information in regard to it appears in the August 15th issue of *Photo-Revue*, from which we learn that the sensitive film is formed with a very thin gelatin, which has small tendency to curl or frill and dries more quickly than the thicker films often used. It is also stated that the thin film adheres better through the several processes to which it is subjected, but detach-

ment is easily accomplished when dry. A paper coated with barium sulphate is used, but some details are still secret. The anti-halation quality is an advantage. To bring the thin sheet to the proper level in the plate-holder, it may be necessary to back it with a stout piece of cardboard. It is advisable to have the several solutions not above 20° C. (68°F). With slow developers, the sheet should be placed directly in the liquid. A slight curling will be noted and then the sheet will become flat. With rapid developing it is recommended to place the sheet coated side up and drench it with the solution. Development should be pushed until the whites show some darkening, and even the whites left by the protection of the frame of the plate-holder show some greying. Washing should be in 10 to 12 changes of water every five minutes, after a rinsing for 2 minutes on removing from the hypo. Washing for a long while in running water is liable to loosen the gelatin. Fasten on a convenient shelf with a pin and allow to dry for about twelve hours. The film may be varnished with a solution of 5 grams of celluloid in 150 c.c., of amyl acetate. It is plunged into this solution, drained and allowed to dry. Mr. L. Tranchant, who communicates the above data to the *Photo-Revue*, regards the introduction of these paper negatives as a very important step in encouraging amateur photography.

Stereoscopic Portraits. *Das Atelier des Photographen* has an article on this subject, referring to an invention made in 1853, by a Philadelphian, J. F. Mascher, who took out a patent in that year for an "Improvement in Daguerreotype Cases." The main feature of his invention was the provision of a small convex lens attached in a movable flap in the case containing the picture so that it could be viewed somewhat magnified, but the special feature was the making of two portraits by stereoscopic methods and providing a pair of lenses for securing the effect. The German writer figures the apparatus, and states that the pictures show an exaggerated solidity and were probably made by a collodion film on glass, being therefore, of the nature of the ambrotype, which was much in vogue prior to the introduction of the paper positive. A picture of the apparatus is given. It is interesting to note that one of these stereoscopic portraits is in the possession of the Franklin Institute. It was

evidently made by a stereoscopic camera, for the two pictures have noticeable, though slight differences, and when viewed with the lenses show a strong, indeed, excessive solidity. The claim in the patent does not specifically refer to the application of stereoscopy, and the inventor put on the market many cases with single pictures. The attention given to the matter indicates that the Germans, like the French, are taking much interest in the revival of stereoscopic work. A special field which has been the subject of a good deal of discussion lately in the projection on the screen of the effect of solidity.

Improvement in Mercury Intensification. Professor Namias, in *Il Progresso Fotografico*, notes that occasionally the mercury salt may be retained in the gelatin film, and cause spots, unless an acid bath is used between the bleaching and darkening. He avoids the necessity of such acid treatment by using a bath with ammonium chloride (sal ammoniac), acidified with hydrochloric (muriatic) acid. He gives the following formula:

Water	1000 c.c.
Ammonium chloride	150 grams
Hydrochloric acid	10 c.c.
Mercuric chloride	20 grams

The commercial articles will probably be found suitable. A short washing with water will suffice to remove all the mercury salt and avoid stains and veiling.

Reversed Dye Images

J. Crabtree, in *British Journal of Photography*, gives the results of his experiments with dyed gelatine silver images. If these dyed images, where the dye is easily reducible, are fixed in acid hypo, the dye in the region of the image is reduced to the leuco base by the hypo, in conjunction with hydrogen ions.

If the silver is then dissolved but by Farmer's reducer, a reversed dye image of the original picture remains. Thorough washing is demanded between the bleaching of the dye and oxidizing the silver image. At this stage the dye in the high lights will also be washed out unless fixed by a mordant.

Positive dye images may be had by immersing the plate in the reducer without first washing out the leuco base.

The dye in the high-lights may then be removed by thorough washing.

Recent Patents

1,380,810. Folding Camera. In a folding camera, the combination with a body, a bed hinged thereto and a lens mount pivotally supported on the bed, of a jointed brace for the lens mount pivoted to the bed and a device for breaking the joint of the brace.

1,381,548. Film-Developer. A film developer comprising a receptacle for the developing medium, and rotatable supporting rods extending within said receptacle in spaced relation, said supporting rods being tubular and slotted upwardly from their lower ends and adapted to receive the respective ends of a film so that the film may be wound from one of the supports to the other.

1,385,912. Method and Apparatus for Using Dissimilar Films. A method using related dissimilar films for projection, comprising feeding said films, through appropriate projection machines, controlling the feed of said films so that they have a definite speed relation, and providing each film with opaque portions for a length corresponding to the transparent portion of the other film, whereby the sequence of projections from the films is continuous.

1,382,978. Photosculpture. The art of making plastic reproductions of three dimensional objects, which consists in casting a shadow circumferentially on the object, in causing the shadow to progress successively over the surface of the object, in making a series of photographs of the shadow thereby obtaining a series of contour lines representing successive sections of the object, and in making pantographically from these photographs the reproduction desired, substantially as set forth.

1,386,733. Film-Shifting Device for Cameras. In a device of the class described, a camera with a shutter mechanism suitable for a variety of exposures, an automatic film-shifting mechanism adapted to co-act with an intervally holed or notched film, controlling means in locking arrangement with said film-shifting mechanism for starting said film-shifting mechanism when out of engagement with said hole or notch, solid means operatively associated at all times between said shutter mechanism and said controlling means for actuating said controlling means directly from the shutter mechanism after a predetermined exposure has been completed, and means for causing the said film-shifting mechanism to stop and be locked regardless of said film when the next hole or notch in said film is brought into engagement with said controlling means.

1,385,162. Motion-Picture-Projection Apparatus. A shutter for a projecting machine comprising a base member of opaque material having a plurality of apertures formed therein and solid transparent heat screens mounted in the apertures, said screens having the property of selective retardance of the heat rays and transmission of high percentage of visible rays.

1,385,940. Method of and Apparatus for Determining Photographic Exposures. That method of determining photographic exposures which consists in determining the actinic intensity of light falling upon the observer, making a photometric comparison of said light and the light reflected from the subject to the observer and expressing the exposure as a function of the two values thus determined.

1,385,365. Photographic Drying-Machine. In a machine of the character described, a drying chamber partly open at both ends and having an outlet at its top, a partition extending lengthwise in the upper portion of the chamber and having openings at spaced points, means for adjusting the areas of said openings, heating means disposed in the lower portion of the chamber, an endless conveyer having one of its reaches extending lengthwise through the chamber above the heating means, and a series of inclined plate holders carried on the conveyer.

1,386,703. Photographic Camera. In a camera, the combination with an exposing chamber, means for feeding a continuous strip of film through the chamber and delivering it from the bottom thereof, and a severing device adapted to cut the delivered films into sheets, of a long, narrow dark chamber beneath the exposing chamber into which the severed sheets are delivered and a conveyer within the dark chamber arranged to receive the sheets and carry them in a substantially straight path toward the end of the dark chamber in continuous contact with the wall thereof.

1,384,372. Photographic-Printing Machine. In a photographic-printing machine, a base having a source of light, an opening therein covered by transparent material to receive the negative, a carrying frame pivotally mounted on the base, a pressure pad carried by and having a limited free movement with respect to the frame, a spring rod supported on the machine and having a sliding connection with the carrying frame, a light circuit having spaced contacts arranged in the path of movement of said rod in the operation of the carrying frame, whereby said rod is adapted to close and open said circuit as the carrying frame is moved to an operative or inoperative position.

1,385,403. Machine for Treating Photographic Moving-Picture Films. In a machine of the class described, means for propulsing a film, means for forming a loop in the film, and means associated with the film propulsion means and operated from the loop forming means to vary the speed of the film so as to maintain substantially constant the length of the loop.

1,383,460. Color Photography. A two-color photographic process which consists in preparing pairs of negatives on successive portions of a single light-sensitive surface by exposing the negatives of a pair in succession respectively to direct white light and through a yellow color-screen of a color value substantially equivalent to that of a screen composed of flavazin, preparing positives therefrom, and thereafter exhibiting the positives in color, the color from the positive prepared from the negative which was exposed directly to white light being approximately blue-green and the color for the other positive being approximately of a reddish shade.

1,383,395. Photographic Exposing Apparatus. In a camera, the combination with a film feeding roll and gearing including a ratchet for turning said roll, of a shaft having an operating crank thereon, a pawl on said shaft co-operating with the ratchet to drive the feed gearing intermittently in one direction, a shutter mechanism, and a shutter winding and releasing member driven in two directions by the operating shaft, but adapted to wind and then to release the shutter during its movement in only one of said directions.

1,386,909. Retouching Machine. A retouching instrument, comprising a casing, a drive shaft extending from and having bearings at one end of the casing, a pencil or stylus carrying shaft extending from the other end of the casing and provided with a universal journal, a bearing for said journal fixedly held in the casing coaxially with the drive shaft bearings, a radially adjustable connection between the adjacent ends of the shafts, a sleeve slidable on the casing near its stylus carrying end, and bars extending lengthwise the casing and connecting said sleeve with the inner bearing of the drive shaft.

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The Pittsburgh Salon has conferred the honor of "Contributing Membership" on the following pictorialists: William A. Alcock, New York; Richard M. Coit, Brooklyn, N. Y.; G. H. S. Harding, Berkeley, Calif.; George H. High, Chicago; T. W. Kilmer, New York; Holmes I. Mettee, Baltimore, Md.; Ernest Williams, Los Angeles, Calif.

A New Light

According to the *Daily Express* the discovery of a remarkable new light which, it is claimed, on the darkest nights will flood our thoroughfares with "daylight" of hitherto undreamt-of intensity, has been made by Mr. H. Stringer, a photographer, who lives in one of the home counties. Patent rights are now being sought by Mr. Stringer, and until they are obtained full details of the discovery cannot be given. "My new light is, to a certain extent, a development of the illuminants now in use, and can be easily installed by electric and gas supply companies," said Mr. Stringer to a *Daily Express* representative. "The light is intensified and natural—more like daylight than any other light known. It will cost no more than electric light does at the present time, and will, at first, be shed from glass bulbs of similar type to those at present in use."—*Process Monthly*.

A Group by Benjamin West

We are inclined to undervalue that which may have cost but little effort to produce. And the truth of this we find exemplified in a small picture painted by our native painter, Benjamin West. It is a picture of his own family and it was farthest from his thought how much it would surpass in interest many of his more ambitious works.

The subject is the first visit of his father and elder brother to his young wife after the birth of their second child. The Wests were Quakers, as you know, and the venerable old man in his plain garb and the eldest son in equally somber attire, and both wear the peculiar broad-rim hats, according to the custom of Friends.

Nothing can be more beautifully conceived than the mother, bending over the babe sleeping in her lap.

She is wrapped in a white dressing-gown and her other son, a boy of six years old, is leaning on the arm of her chair. West, himself, stands behind his father, with his palette and brushes in his hand, and the silence that reigns over the whole is that of religious meditation; which will probably end, according to the Quaker custom, in a prayer from the patriarch of the family.

The picture itself is quite small, and the engraving from it is about the same size. We might call it a family miniature. It has no excellence of color, but the masses of light and shade are impressive and simple, and it is in no way disparaging to it to say

that it strikes one at first sight as a fine specimen of a family group by photography.

Infancy, childhood, youth, middle age and old age are beautifully brought into association in the quiet chamber of the painter's wife. It is an illustration of the often-painted subject—the "seven ages of man." Had West been employed to paint these five ages here, he would perhaps have given himself a good deal of trouble to produce a work that he intended for the classical. But what would such a work, painted in the style which in his age was considered essential to high art, be compared with this, which, no doubt, he considered commonplace and which owes its preservation to its association more than to the value the painter himself set upon it. While he succeeded in making a picture intended only for himself, yet for that reason a picture for the whole world. He put his whole heart in his work, and reflects in it Nature unalloyed, and if painters and photographers would do the same instead of aspiring too high after pseudo-art how much more interest would their work have for those who have sentiment and feeling above captious critical judgment along the prescribed canons of art.

Messrs. J. Hauff & Company announce through their American agent, G. Gennert, the production of a new developer, the remarkable qualities of which will undoubtedly secure for it immediate interest, for its properties are entirely original and of the greatest value to photography.

Neol equalizes the greatest contrasts in lighting and permits of the greatest leeway in the time of exposure. It entirely overcomes halation and in the hands of either the amateur or the advanced worker it will prove a boon. It simplifies photography for the beginner by reason of its property of correcting error in exposure and places in the hands of the advanced worker the opportunity for decidedly artistic results.

The commercial photographer will find that it entirely overcomes the difficulties of photographing glass, china, metal, statuary, etc. The home portrait worker will find it ideal for he can photograph his subject directly against the window with impunity, the portrait obtained being entirely free from halation.

Neol has another great advantage in that the most beautiful sepia tones on gaslight paper can be obtained by direct development. Further particulars about this new developing agency can be obtained from G. Gennert, 24 East 13th Street, New York.—*Adv.*

Blue Ground Glass

This is difficult to meet with in the trade, but the following is a method of making it. Take a sensitive plate, fog it slightly by burning a taper at about half a yard above it for from five to ten seconds. Develop with a slow developer, so as to have a light grey tint; after fixing and washing, intensify with bichloride of mercury and wash well. Mix a penny packet of powder blue in about 7 ozs. of water; this dye poured to the depth of half an inch in a porcelain dish should be of a dark blue. Put into it the bleached plate, which will soon become stained. Remove before the desired opacity is obtained, and wash. Objects should be visible on the ground glass. A monochrome image is produced and the operator is not carried away by the beautiful colors of the landscape.—*Le Moniteur de la Photographie*.

Blue and Green Tones With Gelatino-Bromide Prints

The double ferrous salts, and especially ammonia-citrate of iron, are best for this purpose. Dr. Vogel recommends the following formula, which greatly resembles the uranium intensifier:

A

Ammonia-citrate of iron..... 1 part
Distilled water 100 parts

B

Ferricyanide of potassium... 1 part
Distilled water 100 parts

These two solutions keep well in the dark; but it is well to add a few drops of acetic acid to the former, to prevent the formation of basic salts. The toning bath consists of:

Solution A 50 ccm.
Solution B 30 ccm.
Glacial acetic acid..... 10 ccm.

The acid is added to counteract the hardening effect of the ferricyanide on the gelatine. With pure reagents no precipitate should form when the solutions are mixed. The print on paper or on glass is immersed, either wet or dry, in the bath. All the gradations of tints from blue-black to a decided blue can be obtained, according to the duration of the action of the bath. After toning, the print must be washed until the water loses all traces of milkiness. The blue coloring can be removed by means of dilute ammonia. Green tones are obtained by a preliminary treatment of the print with uranium intensifier, followed, without intermediate washing, by the use of the above-mentioned bath. The intensity of tone,

either green or blue, depends on the predominance of the action of the corresponding solutions. To simplify the process, a single solution may be made up as follows:

Solution of uranium nitrate
(1:100) 25 ccm.
Solution of ammonia-citrate
of iron (1:100)..... 25 ccm.
Glacial acetic acid..... 10 ccm.
Solution of ferricyanide of
potassium (1:100) 5 ccm.

With this bath a malachite green tone is obtained; but if the washing be too prolonged the image becomes blue.—*Bulletin de la Société Caennaise*.

Photographic Images on the Brain

The mechanism of the action of the brain is entirely unknown to physiologists, so that we are prevented in most cases from drawing any definite conclusions concerning the processes which take place in vision. Munk and others who experimented on dogs have, however, demonstrated that there are certain areas in the brain which may be called the visual sphere, and recently Henscher furnished proof on excellent pathological observations on man that there is a projection of the retinal image on the human brain. Vision is not only the result of formation of a picture or image upon the retina, but also on the brain itself.

It has been known for some time that many animals—chamelions, and especially certain fish, adapt their color and the pattern of their skin to the ground upon which they happen to be. This fact has been used in support of the theory of natural selection and protective agency of animals to conceal them from predatory destruction.

Ponchet showed many years ago that this adaptation of fishes to their ground, ceases as soon as their eyes are removed; that is, as soon as the retinal image is prevented. This fact proves that the harmony between color and pattern of the skin of fishes with their surroundings is transmitted through the retinal image. In other words, the adaptation by color is only the transmission of this retinal image by the nerves to the skin. It is a picture reproduced from the retinal image. Summer showed that certain fish actually reproduced on their skin rather complicated patterns forming the bottom of the aquarium in which they were placed.

These observations suggest the idea that vision is a kind of telephotography.—*Physiologisches Centralblatt*.

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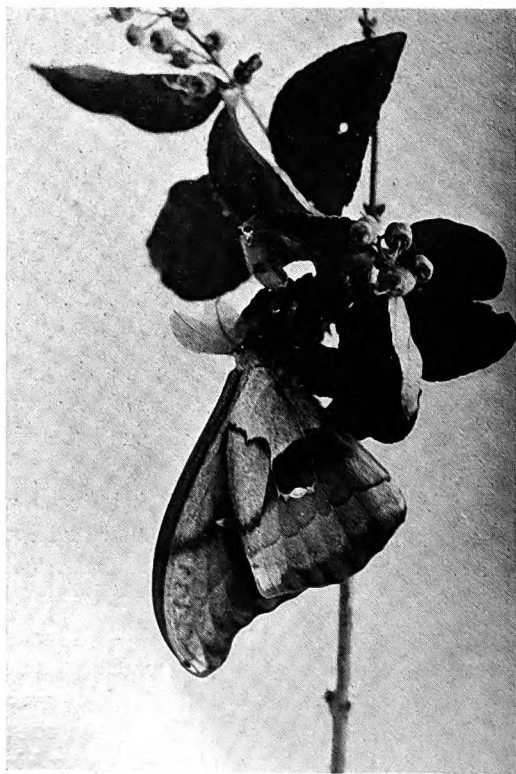
MOTHS AND HOW TO PHOTOGRAPH THEM—L. W. BROWNELL

DURING the late fall, winter and early spring one is all too apt to imagine that there is little or nothing out of doors that could, by any possible stretch of imagination, be of the least interest to the Nature photographer, but this is not so. It is true that this is the time of the year when Nature takes her long sleep that recuperates her for the strenuous life she must lead during the spring and summer, but, never-the-less, there is much of interest for our camera, much that can be obtained at no other time of the year and which should not be missed by one who would make a fairly complete list (for no one person could ever make it complete) of Nature pictures. Moreover this is the period when the majority of us, I am sorry to say, prefer to remain in the warmth of our steam-heated houses except when forced by duty to leave them, and this is all wrong, for by doing so we miss much that is beautiful and pleasant and, furthermore, would we keep in perfect physical condition we must be in the open as much as possible, even though the air in the open may be hovering around the freezing point.

It is true that the lack of incentive is all that keeps many of us from tramping the woods and fields during the cold weather and Nature photography offers that incentive. Let him who thinks that there can be no pleasure in taking a tramp, when the mercury in the thermometer is dallying about the bottom of the tube, only try it once with an object in view and clothed with due regard to the severity of the weather. I will guarantee that when he returns it will be with the firm resolution of trying it again at the first favorable opportunity. If not then, he is emphatically not the one to whom I would recommend the pursuit of Nature photography, rather let him devote his time to knitting or patchwork.

I can hear my reader exclaim that moths cannot be found, much less photographed in the winter time, but this is not quite true. Certain it is that the moths themselves are not abroad in the cold weather any more than are the butterflies or other insects, but their chrysalids and cocoons are to be found and these are what we must search for if we would obtain first-class photographs of the moths and which forms one of the incentives for a winter's tramp abroad.

The moth is, by nature, a creature of the dark and it is seldom, and then only by accident, that one can be found during the daytime. Occasionally, when on a butterfly photographing jaunt, we may be fortunate enough to find one asleep among the leaves of the low herbage or on the trunk of some tree and, when this happens, we will, naturally, grasp the opportunity of adding his picture to our collection. Unfortunately these occasions are rare and would we obtain a good series of moth pictures to add to those of the butterflies we have obtained, we must first find their cocoons, take them whole and allow them to "hatch." This in itself is an extremely interesting pursuit and one from which we can gain a great deal of useful knowledge aside from the fact that it furnishes us with subjects for our cameras.



"MALE POLYPHEMUS"

L. W. BROWNELL



F. S. NATUSCH

"THE KING BEE"



F. S. NATUSCH

"PUZZLED"

These cocoons and chrysalids can be found at any time during the late fall and winter hanging from the trees, among the low dead weeds, underneath loose bark, attached to the limbs and trunks of trees, beneath stones and in many other situations. The search for and finding of them forms one of the chief pleasures of this pursuit and the incentive for the tramp.

They themselves should be photographed and then, if kept in a fairly warm place, the perfect insects will commence to emerge in the late winter and early spring, long before they would do so if left out of doors, and one is apt to find that he has even more subjects than he knows what to do with. If one would make a most interesting series he can start with the caterpillar when it attains its full growth in the fall. Let him take home any that he may find in September or early October. At this time they are fairly certain to be nearly, if not quite, full grown and ready to pupate. Photograph them and then place them in a box covered with netting in which place also a few leaves of the plant upon which the caterpillar was found. They will, in most instances, soon spin their cocoons which can then be kept for the moth to emerge.

The moth, newly emerged from the cocoon, is a sorry looking creature. His wings are merely crumpled bunches on each side of a body that is so large



"FEMALE PROMETHEA MOTH"

L. W. BROWNELL

and unwieldy as to appear grotesque. To the uninitiated it must certainly seem as if a deformed and imperfect insect had come forth in the place of the perfect one for which he looked. He need not be discouraged, however, for in a short time, a matter of two or three hours, the wings will straighten out and the body contract until the former have reached their full expanse and the latter shrunk to its proper size. There is now a period of several hours when the insect will be more or less quiescent waiting for its wings to dry and stiffen sufficiently to allow of using them as nature intended. During this period it is possible to do with them about as one likes and to place them upon any support upon which one would care to photograph them. While their wings to all intents and so far as can be discerned are perfect, they are still too limp to carry them away and so they must, perforce, remain where they are put.

The photography may be done either in the house or out-of-doors as one may prefer, for the insect will neither fly away nor move to any great extent during the operation. In fact it will generally remain so quiet that a time exposure of some length may be made with perfect safety. However, if the work is done out-of-doors, this will be found unnecessary, as in the sunlight

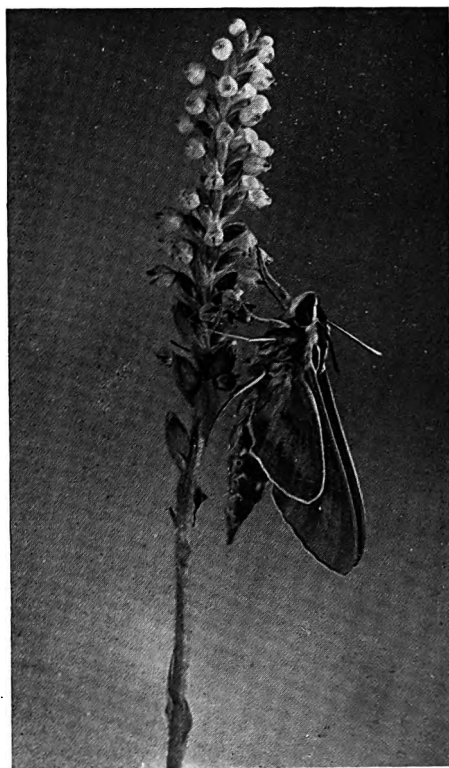


"ATTAIUS CECROPIA—MALE AND FEMALE"

L. W. BROWNELL

the second or third stop may be used and an exposure of about $1/25$ of a second will be ample unless the lens is a very slow one.

When making the photograph in the house the work should be done close to a window, one facing the north being preferable. Across the bottom of the window a piece of cheesecloth should be pinned. On one side of the window place a low stand or stool on which is the twig, spray of leaves, blossom, or any such suitable thing on which to pose the moth. Back of this at a distance of about a foot place a white screen as a background and on the side away from the window, as close to the subject as is possible without having it show in the picture, place another white screen to reflect and equalize the light. These are all the preparations necessary. Now place the moth carefully upon the flower or whatever has been chosen upon which to pose it, and wait until it has become perfectly quiet, which will usually be in a few minutes. With the camera at the other side and a little closer to the window than the subject, focus sharply upon that part of the insect nearest to it and stop down until everything is in sharp focus. It will usually be found that this will not necessitate a very small stop and the larger the better, for it is always possible that a living thing will suddenly take a notion to move and the quicker the



"DEILEPHILA LINEATA"

L. W. BROWNELL

exposure the less danger there is of this happening. If the day is bright and a fairly rapid lens is used, the exposure can be based upon about two seconds with the lens wide open and doubled for each smaller stop used. An orthochromatic plate will give better color value than the ordinary one.

A tripod camera is not necessary in this work, although with it one can obtain life-sized images, which is an advantage. Any of the hand cameras may be used, however, and with the addition of the portrait attachment on the lens, will give sufficiently large images, especially of the larger moths. It can be rested on the top of another stand and time exposures made which, of course, will be necessary with the ordinary hand camera. I would advise an exposure of about five or six seconds using the third stop. With the Kodak or Graflex fitted with one of the faster lenses working at $f4.5$, a much more rapid exposure may be given. The matter of exposure, however, depends entirely upon the strength of the light and can more easily be determined by the operator after two or three trials than by using such advice as I can give.

If the work is done in the sunlight, then the stand with the moth and the background must be moved out-of-doors or, if one is fortunate enough to have a sunparlor attached to his house, this makes an ideal studio. Here the reflecting screen is unnecessary and, if the sunlight proves to be too intense, as sometimes happens, making too heavy shadows, this can be overcome by placing a screen of coarse cheesecloth between the sun and the subject. In this manner



"ACTIAS LUNA"

L. W. BROWNELL



"STUDY"

BEN V. MATTHEWS

some of the best results can be obtained and an exposure from $1/25$ to $1/50$ of a second, with the lens stopped to $f16$, thus eliminating any chance of movement on the part of the subject during exposure.

One word of advice concerning the handling of moths before I close. The scales on a moth's wings are very easily brushed off. Therefore if we would have a perfect specimen without any disfiguring mark we must handle our subject as little as possible. Never grasp him by the wings, for this will prove absolutely disastrous. The proper manner is to take him between the thumb and first finger by the body at the base of the wings with these folded back. By taking care not to pinch too tightly, it is possible to thus handle a moth or butterfly without disturbing any of the scales.

Nature photography is a most fascinating pursuit for anyone who cares to obtain real results with his camera and not just expose plates, and moth photography is far from being the least interesting branch of it. I am in hopes that many of my readers may be induced to take it up.

WHEN THE SURF IS BREAKING— WILLIAM S. DAVIS

THE rush of foaming waves toward the shore and the far flung mass of spray rising in air, after their force has been shattered upon a rocky ledge or reef, is indeed an inspiring sight and one calculated to stir the ambition of the photographer to render in pictorial form. That it is possible to at least suggest the majestic force and beauty of the sea, by means of the camera, is an established fact, but the early attempts of the beginner in this field are also practically certain to prove disappointing to the critical observer.

Although advice will not take the place of practical experience, it may point the right way to overcome difficulties and thus save needless mistakes being made, hence the suggestions which follow.

As the lens can only record what is in evidence at the instant of exposure, the presentation of the material is of prime importance—therefore one should study the subject and try to analyze its character to determine what constitutes the essential elements producing the effect.

One very common failing is the error of including too much subject-matter in the finished print. Our senses may be impressed by the wide horizon and boundless expanse of waves, but all this cannot be effectively reduced to the limits of a postcard! So, instead of trying to accomplish the impossible and turning the composition into a meaningless jumble of details, concentrate upon some small section expressive of the general scene which, if properly handled, will result in an attractive picture, capable of stimulating the beholders' imagination into supplying the missing material.

In working out a composition, one needs to remember that the subject-matter lying in the planes from the immediate foreground to the middle-distance is of especial importance. A distant wave in a photograph never suggests force

and reality as does a "close-up" view. Of course, the nearness of viewpoint, which is most effective, varies with the nature of the scene and the actual size of the waves, while in some instances the inaccessibility of the principal feature, or personal safety, may compel the selection of a rather more distant standpoint than would otherwise be taken. The main trouble with too distant, or too high, a point of sight is the flattening of perspective in waves and masses of flying foam, which subsequent enlargement cannot alter, though it is often a very good thing to enlarge but a portion of the image, when printing from a negative, to simplify and strengthen the effect of the picture through elimination of extraneous matter.

An incoming wave caught "head on" at the moment of breaking is often very effective, but a series of low rollers from such a viewpoint generally form too many parallel horizontal lines to be pictorially agreeable, and are much better viewed from an angle. A perfectly straight beach-line is quite undesirable as a foreground feature, whereas the irregular curving line produced by the foaming undertow, as seen in perspective, may be made the strongest feature of a composition. Such a viewpoint also affords the best opportunity to show the curling motion of an incoming wave about to break, while a foreground filled with the bubbling froth from the preceding breaker usually forms an interesting "pattern" of spots and lines which blend into a harmonious mass.

When the subject happens to be a rocky coast "beat by the boundless multitude of waves," care should be observed not to include a relatively large expanse of dark rocks or cliff when the flying spray shooting high into the air is meant to be the dominant feature. A single group of rocks, or jutting point of shore, makes a valuable note of accent which acts as a foil for the lighter tones of the foam, but giving over a large space in the foreground to dark rocks or shore dwarfs the importance of the spray. The best plan is to watch several waves break, noting the space which the spray usually occupies, and then arrange to include a little more of the surroundings than seems essential to allow for variations in the position and shape of the mass of spray, since this depends upon such factors as angle of impact and momentary force of the wind.

Lighting and atmospheric conditions play a very important part in the effect presented to the observer. Most of the flatness, sometimes seen in photographs of surf, is due to their being taken when the sun is too high or directly back of the camera, or else from working in an extremely dull light. A comparatively low angle of illumination produces the requisite proportion of shadow to give relief to the high-lights, which always appear more sparkling by the introduction of a little contrasting tone. The maximum scale of gradation in dashing spray is seen in sunshine when the sun is quite low and to one side. This lighting is also effective upon incoming waves and undertow, though these are also often strikingly beautiful viewed against the light, a *contre jour* effect, giving wonderful sunlight and shadow upon the foam. For subjects which admit of representation by broad masses of comparatively flat tone, the diffused lighting seen on a stormy overcast day can be recommended.

In all surf pictures the sky is important, being capable of making or destroying the pictorial quality of the picture as a whole, according to whether it is in tonal harmony with other parts. Since the brilliance of the high-lights in surf (as in sunlit snow) depends upon the exclusion of any broad area equally high in key, the sky should always be rendered in a tone lower than the highest lights in the spray. A bank of grey cloud, along the horizon, makes a very satisfactory background for a mass of breaking surf, as it photographs with practically the same degree of contrast seen by the eye without the aid of a ray-filter on the lens, and it quite often happens such a cloud is seen while the sun is shining upon the surf, such a combination giving the latter great accent and luminosity. Even a clear blue sky appears darker to the observer than foam in sunlight, but it requires special care to retain this relative value in the negative—a point which will be referred to again.

While a plain sky of suitable tone is quite effective, particularly if flying spray fills a large area of it, there is no doubt but what in a large percentage of compositions a good mass of broken clouds helps to express the driving force of the wind, and when a large portion of the picture-space is given over to the sky, adds greatly to the beauty and interest. As strong clouds and open water require practically the same exposure, there is no difficulty about retaining good cloud effects in the negative, even without the help of a filter.

In the matter of technical procedure, it is advisable to avoid employing a very large camera in a gale, owing to the increased difficulty of operation. A 4 x 5, or at most 5 x 7, is quite sufficient in size to handle easily under such



"STORM SWEPT"

WILLIAM S. DAVIS

conditions, and there is no necessity of using larger, since good negatives, even when made with considerably smaller instruments than those mentioned, will enlarge to any reasonable dimensions.

Lenses of large aperture are not needed, since there is usually light enough and to spare, but it is an advantage to employ one of rather longer focus than usual for the size of camera.

When a suitable foothold for a tripod is available, it is generally advantageous to use one, since it allows the worker to arrange all stationary elements of the subject to the best advantage upon the focusing-screen or finder, after which entire attention can be given to watching the action of the waves, though to guard against the chance of the outfit sailing away at an inopportune moment, it is well to hold the tripod down to terre firma by a weight of some kind (such as a bag of sand or pebbles) attached to the head.

A hood should be provided for the lens, both as a protection from extraneous light on bright days and to help keep off the coating of salt, which quickly forms when it is exposed for any length of time to the spray or spend-rift constantly driven to leeward as a fine mist during a gale. If so made as to protect the shutter so much the better. Even with a hood in place the lens should, if pointed into the wind, be protected until one is nearly ready to make the exposure by holding a piece of card in front. Such a precaution often makes the difference between a clean negative full of good definition and one so fogged as to be worthless.

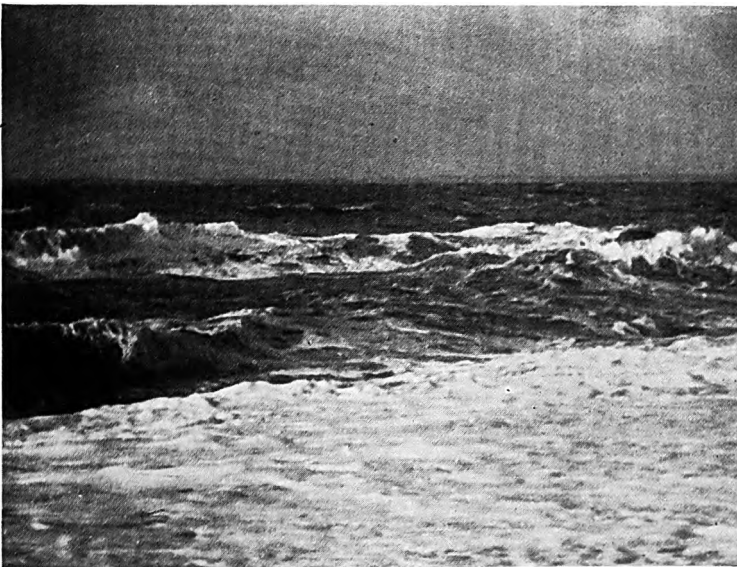
Although not often essential, a light yellow ray-filter—one which will not require more than two or three times increase in exposure—should be made one of the accessories, for while not needed when there are well defined clouds, or dark sky, as a background it will prove most valuable on a bright day when a breaking wave is seen against a light blue sky.

The writer has used both plates and films in this class of work with success, but when the latter are employed, they should be kept in the camera for as short a time as possible, and the exposed rolls developed soon, since they appear considerably more sensitive to the deteriorating influence of damp salt air than dry plates. The best results will be had on plates by selecting a reliable brand of rapid ortho., or iso., preferably double-coated. The imported kind, which contain the equivalent of a pale yellow filter in the emulsion, are very well suited to marine work, being the best substitute where a ray-filter cannot be conveniently used in conjunction with the usual ortho. variety.

With subjects of this nature, which require every means to express vividly the effect of motion in the sea, the exposure should be so timed as to avoid absolute sharpness in the individual drops of flying spray, yet not so prolonged as to render the foam as a woolly mass. As a result of considerable experience, it is my opinion that approximately $1/25$ second in most cases gives the best impression, the only occasion when a higher shutter speed may be advisable being where flying spray is photographed at exceptionally close range. Taking, then, $1/25$ second as a working basis, and rapid plates possessing a speed around f90 to f111 of the Wynne Exposure-Meter list, or 250 of the Watkins

system, one will find it necessary to reduce the lens-aperture on bright days to prevent over-timing. Usually, stop f16 to f22 can be used during the middle of the morning or afternoon on bright days in summer, but when the sky is obscured by storm clouds, a size larger stop had better be selected, especially when there are dark rocks in the foreground. In late autumn or early spring, the actinic strength of the light is only about half as great, a fact which should be considered when adjusting the size of aperture. These estimates are, of course, for exposures made without a ray-filter on the lens. Such films as Eastman Speed and Ansco Speedex belong in the super-speed class, and only need about one-half the exposure of the plates used as a basis for the estimates given.

In practice, one should have everything about the camera in readiness for exposure before selecting any particular wave to photograph—then, when taking a subject in which a mass of flying spray is to form the principal feature, watch the shape of several waves while they are coming toward shore, keeping in mind the appearance of the one which produced the best effect while breaking, which, by the way, is frequently the third of a series of extra heavy ones. By waiting awhile, a similar combination will usually occur, and while seen approaching, one wave should be selected and its progress closely watched, the shutter release being pressed just before the maximum effect takes place—it being necessary for the eye to anticipate this by the fraction of a second to allow the hand and shutter to respond to the call made upon them in time. Some failures will occur, especially at first, since one may press the release a bit too soon, or the wave not break in just the shape expected, even an experienced worker some-



"WHERE THE WAVES ROLL WHITENING TO THE LAND"

WILLIAM S. DAVIS

times being deceived about the latter, but all this is part of the game and bagging a single fine effect should be considered worth the time expended.

Care should be taken when developing negatives to avoid blocking up the lighter portions, and thus losing gradation in the surf, but on the other hand, a moderate amount of snap is required to avoid flat high-lights in the finished prints. Suitable lighting and exposure is essential as the foundation and with this to build upon, any clean and fairly soft-working developer will give the results desired.

As an outfit is likely to get somewhat rough usage in this class of work, it may not be out of place to add a word of advice about cleaning up after a day's work, for if allowed to remain, the salt spray will quickly form a crust that will spoil the finish of metal parts and spot the leather covering or bellows. For this reason it is best to wipe off all the exposed parts with a lintless cloth, wrung out of fresh water—avoiding, of course, any slop which might get into working mechanism—then, after allowing the surfaces to dry, rub with a rag slightly moistened with some light oil, such as “3 in 1,” which may be applied to metal, wood and leather parts, including the bellows. If a little care of this kind is given promptly an outfit can be kept in first-class shape indefinitely.

NOTES ON MOUNTING

TO an onlooker, the mounting of a photograph might seem too simple to need instructions and too trivial to merit discussion, but any one who has had years of close connection with photography will agree that there is much more in mounting than “sticking a print on to a piece of cardboard.”

Mounting, to be good, requires considering from at least two sides, the artistic and the technical, and unless we happen to be wealthy amateurs, we must also remember the £ s. d. standpoint.

For every photograph a mount can be made or bought that will, by reason of its color and design, show up the particular photograph to best advantage. And mounts innumerable can be made and bought that can do neither credit nor justice to the same picture.

Should mounts be bought ready made, or is it better to build up one's own? There are certain advantages either way. The mount manufacturer has resources at his command that make it impossible for the photographer to imitate his products; and if our work is in a definite and regular style, with a constant quality and tone, we are certain to find something on the market that is superior and more suitable than anything we could make ourselves. But for work that varies in contrast, key or tone, there is much to be said for built-up mounts designed deliberately for individual photographs or orders.

There are no universal rules determining what colors or shades can or cannot be used on a mounting job. Some workers restrict themselves to the use of tints which are in agreement with the print, and for a cold black and white would not touch anything outside of black, white, green and bluey greys. For warm black and sepia work this school would only use white, buff, cream and

brown. Others will combine cold and warm tints in the same mount for either a black or brown picture, often with excellent results, but where there is any doubt the first mentioned system is the safer. With prints that need no improvement, either in depth, contrast or color, there is a greater choice of mount shades than with work that is not quite all that it might be.

A faulty picture can be made to look much better—or much worse—than it is by its mount. To render a fault inconspicuous, or to make poor quality appear to be quite “the thing,” the usual plan is to “go one worse” with the mount. For examples: A certain print has extremely black blacks; it would have been more to our liking with warmer blacks. We mount it on blue-black against which it appears warm in comparison. To put it on anything warm would only enhance its cold blackness and so make it worse. A sepia is “mustardy.” Mount it on pale brown, buff, cream or coffee and it will probably appear all right, but to put it against a rich Vandyke brown will convict it on the spot. Exceptionally disagreeable tones can sometimes be made to look exceptionally artistic by mounting on the same (exact) shade. A photograph that is dark should be put on a darker mount. On a white one such a print would seem darker again than it really is. The same principle applies to a pale picture, which requires a pale mount if it is not to appear bleached or faded. A soot and chalk type of print needs a contrasty mount, *c. g.*, white with black tint, and a soft or flat print will go best on a combination of very near tints, *c. g.*, deep cream and buff or light grey and medium grey.

Pencil and brush can be useful in mount making, but they are not taken any great advantage of. For good work where the design of a mount is not required to bolster up the print, very natty effects are obtainable by lines in pencil, ink and water color. A fine border, if done neatly and accurately, is often more effective than any tinting scheme. Fine border lines in gold paint on a rich brown are very attractive.

The most suitable size for a mount is best found by experiment, particularly if the picture is long in comparison with its width or of an oval or circular shape. For standard-sized pictures the sizes favored by manufacturers are quite suitable for all but exceptional orders. The position of the picture should always be slightly above the true center if the mounted result is not to appear pushed down or squat. It is a general rule to have the side spaces precisely equal, but if the subject is such that a print looks well placed when decidedly to one side there can be no objection to mounting it so. But such a departure must be definite. There must be no suggestion that the result is merely due to crooked sight on the mounter's part. I have known an odd occasion when a head portrait looking towards the bottom right-hand corner of the print, was advantageously mounted in the top left corner of the mount, the tint showing slightly wider on the right and bottom sides.

I am not an advocate of plate marks, but for those who like them there is a fairly simple way of making any desired size. The requirements are two pieces of thin mounting board (4 to 6 sheet) slightly larger than the size of mount to be marked, and some *passe-partout* binding. With a mount placed between

them, the two cards are bound along one edge. When the binding is set the inner face of one card is marked in pencil with the desired size for the plate mark, and after making sure that the corners are square and that the mark is central, the lines are gone over with a very sharp knife guided by a straight-edge. When the piece has been cut cleanly out, a few drops of seccotine are rubbed on to it (without removing it), and the other card is folded over and the whole left under a weight until the adhesive has set. The center square will now be attached to the top card and will lift out of its original opening when the cards are opened. A mount placed between the two and pressed in the dry-mounting machine for a few seconds will be neatly plate-marked. If there is no machine available the effect can be got—but not so quickly—by pressure under a gross or so of large mounts or other large flat weight.

Cut-out and flush bevel mounts are applicable to a large variety of photographs, and have their points. The former, particularly in delicate shades, give quite a distinctive appearance to good pictures of any size. Rectangular cut-outs are done by hand with the knife, but are not difficult if a good edge is kept. Ovals and circles require much more care and patience; but for these, machines can be obtained that eliminate the factor of manual dexterity. Bevel mounts can be cut in a special board or in the same way as square cut-outs. They are perhaps the simplest mounts of all, as they merely add stiffness, substance and finish to a picture without affecting its spectacular quality.

The substances that can be used for attaching a photograph to its mount are numerous. I will deal only with the most important, which are starch paste, proprietary pastes, gelatine, "Seccotine," gum arabic, and shellac. Starch paste, if properly made, is a strong, clean and safe mountant which sets into a hard and durable binding. Provided that no traces are allowed to dry on the face of the print or mount, starch is quite satisfactory as a mounting agent. Prints can be mounted with it in a dry or wet state, the latter being the easiest and most usual way. Proprietary pastes of good makes are very similar to starch, and can be used with confidence. Gelatine, made in a thick, warm solution, is a very strong mountant that can be used on dry prints. It can be prepared by dissolving gelatine in warm water to get a thick syrupy liquor which is thinned down sufficiently for use by heating without the addition of water. "Seccotine," let down with water, makes a clean mountant. Whether it is liable to produce any after effects I cannot say. I have used it myself without so far coming across any symptoms. Used as it comes from the tube, it will mount thick papers if spread thinly along the edges of the dry prints. Gum arabic, prepared by hanging a bag of crystals or dust in a bottle of cold water until sufficient has dissolved to make a thick gum, can be used on dry or wet prints, but does not stick so readily as gelatine or "Seccotine."

Shellac dissolved in methylated spirit will mount dry prints cold or hot. In its well-known form of tissue it provides what is probably the most popular system of mounting at the present time. When using tissue, the right temperature is of paramount importance. This varies with different batches, and the correct degree should be found by experiment when starting on a fresh lot.

By keeping a small thermometer on the dry-mounting machine, work is greatly facilitated, once the best temperature for the tissue in use is known. After using large quantities of present-day tissue, I am of the opinion that it is not as good in the aggregate as other photographic products. Perhaps I am too exacting, but in any case tissue has the advantages of being clean and dry to handle and innocuous and protective to the print. Dry-mounting can be done with a large flat iron where no machine is available.

With dry or wet mounting, the actual degree of humidity of the print is a matter of some importance. In the first case prints must be really dry to avoid risk of the surface sticking to the zinc plate or blotting paper, whichever is used to cover. If there is any doubt on the point a print can be put in the moulder, or under the flat iron and given a momentary press, which will remove any dampness before there is time for sticking. In wet mounting prints must be thoroughly and evenly wet. If they are not properly soaked the expansion due to wetting will be uneven, and they may dry up not truly square. Some workers trim their prints to avoid this, but there is no necessity to take the extra risk if care is taken to soak prints thoroughly before wet-mounting. At the moment of pasting, however, there should be no surplus moisture. A print that is pasted while covered with water is not likely to stick well, as the paste will be greatly diluted. Another thing, the paste and water will be apt to roll out under pressure and deface the mount. When rolled down quite flat, mounted prints should be left under pressure for some little time unless the adhesive is known to be very strong, when they can be safely left exposed to the air, in which condition they will dry more rapidly. In either case pressure or restraint of some kind is wanted *on the mount* to prevent cockling, which is the bugbear of wet-mounting.

The keeping qualities of mountants are uncertain properties. Pastes are best when freshly made, but will keep for long periods if a preservative is present. I have used chloroform and chloroform water for preserving pastes with good results. Proprietary pastes always contain preservative, and should keep for a reasonable time. Dry-mounting tissue is said by some to be subject to the air, and to lose its adhesive properties if left lying about or in uncovered boxes. Whilst I cannot corroborate this from experience, it sounds feasible, but the remedy—or prevention—is obvious and simple.

When mounting is done on a large scale, and particularly if done for profit, *i. e.*, professionally, the *£ s. d.* point of view is important. By studying different manufacturers' catalogues it will be found that a style or variety of mounting may be carried out at different figures. It will also become apparent that certain styles of made mounts will prove cheaper or dearer than similar or equally serviceable styles made up from boards and tints. With cut-outs and bevels we have to take into consideration time and labor on one hand, and the advantage of buying quantities of large boards and the possibilities of economical cutting on the other. For example, a 15 x 12 cut-out may take up a little time and necessitate some skill to cut, but it may be made from comparatively cheap board and still be effective, and the centerpiece will make another mount for a smaller

picture. To have a substantial result, the prints should first be rough-mounted, of course, but this can be done on waste mounts or thin cardboard or thick tint board, and need not add very much to the cost. For two cut-outs, one 15 x 12 and the other 10 x 8, we would require one piece of board about 24 x 18, two old mounts or pieces of thick tint about 16 x 13 and 11 x 10, two sheets of dry-mounting tissue, 15 x 12 and 10 x 8, about threepennyworth of "Seccotine," and the necessary labor and time. For good work we can add brown paper and a trace more "Seccotine" to back the mounts. To work out the cost of such a job from a wholesale price-list of mounts, and then compare it with the cost when using various made mounts, keeping in mind the artistic side of the question, would provide a good example of how useful business methods may be. It must always be remembered though that to buy consistently in the cheapest markets is risky, and to sacrifice artistic quality to cost may prove the dearer way in the end. To maintain technical and artistic excellence without unnecessary outlay should be the aim of any one undertaking mounting on a business scale.—*Thermit, in The British Journal of Photography.*

ILLUMINATION AND EXPRESSION

A PROPER contrast of light and shade, an agreeable interspersion or distribution of both these qualities in a composition, and the selection of the proper time and position from which a portrait may be felicitously reproduced constitute, in a great measure, the whole science or art of portraiture.

We are all familiar with the terms "lighting" and "expression," especially as applicable to portraiture, but they are equally as applicable to landscape and architecture, since these also owe all their attractiveness as artistic reproductions to the effect of light and shade and atmosphere.

We are ready enough to acknowledge the value and importance of lighting, but do not always give it that attention which is essential to securing that rather indescribable quality called expression.

Attention to illumination is more demanded than excellency of definition. Artists are more apt to estimate a picture for its chiaroscuro than for the motive it may seek to give expression to. No matter what the subject may be, however commonplace, if feelingly lighted and treated with artistic taste it appeals more to us than an elaborate and well-studied complex composition, giving evidence of the knowledge of all the set rules of art.

Atmosphere is a most potent factor in securing expression. Where atmosphere does not pervade the subject we have everything apparently on one plane, a distant object looking almost as dark in tone as one near by, and, consequently, not suggestive of recession or aerial perspective. We have no idea of depth or distance. Generally speaking, a light should be selected which gives appropriate values to the different planes of the picture.

There is an effective style of illumination secured by having the light almost directly in front, but it demands exercise of judgment and some skill

to avoid disastrous results from fog. Chiaroscuro, or light and shade, may be said to be the art means whereby objects are cast into relief upon a flat surface and given the semblance of corporeity in the three dimensions of space. Without this play of light and shade a painting or photograph is a mere outline, filled in with color or monochrome pigment deposited by a chemical means. The wall paintings on the Egyptian temples show that the painters of those days either did not know the value of light and shade or were constrained by religious conventional rules from giving expression to chiaroscuro.

In most of our photographic pictorial work we have considerable evidence that the artist has appreciation of the value of light and shade, yet we do notice many features of chiaroscuro disregarded.

How often we do see exhibited a picture demonstrating that the photographer is well versed in the laws of linear composition, but ignorant or, at least, disregarding of the important part the foreground of his picture possesses to enhance the effect?

The foreground is often meaningless, mere objects dragged into service, without any consideration of the effect the light has upon them, unbroken by variations and inequalities of light, as Nature would present us with.

All objects in the picture must be rounded out and placed in proper relation by giving to each a due proportion of light and shade. The effect is not dependent upon the intensity of the light, only it must be continuous and proportional throughout.

If we are photographing a head in the studio or out of doors, where in one case the light is subdued and in the other intense, it makes no difference, so that the lights on the nose, chin and forehead are in proportion to the shadows on the sides of the face and neck. The proportionate relationship between the lights and shades must always be kept up.

In order to produce the finest effect it is necessary that the one point from which the light proceeds should be maintained throughout the whole composition. Consistency and proportion must rule in photographic portraiture, however much distinguished painters may disregard the rule.

The principles, therefore, to be observed, are, first, that everything in our picture, no matter how small it may be, should have its due proportion of light and shade; second, that there should be one point of the compass from which the light seems to come; third, that there be a center of light in the picture itself from which all the other lights radiate until they are lost in the shadow.

Sometimes the photographic portrait is criticized adversely for presenting in parts the shadows apparently too dark. These dense shadows naturally happen if the light is rather strong, but if well managed they are often effective. Look at a person's face and you perceive the shadows under the chin much darker than the chin itself.

The shadows of an object on the sidewalk is darker than the object producing it. Again, objects may be rounded off or blurred by atmosphere, but their shadows are not blurred, but sharp and distinct, and it is well to keep this in mind when we try impressionistic work.

IDIOSYNCRASY OF THE LENS

IT MAY not be necessary for the pictorialist to be a lens expert to evolve his esthetic conception; indeed, the high exponents of the artistic phase seem rather to abrogate the significance of their optical tools. However, it may be of importance, even to the esthetic, to become acquainted with lens peculiarities or idiosyncrasies, even if he regard photography solely as a means to artistic expression. He ought to know a little, at least, of the optical principles to get the full worth of the lens's pictorial utterance. Now, we do not mean that it is sufficient to know focal length, the rapidity or depth and definition, but that he should especially know how it is of advantage to sacrifice certain considerations for certain other considerations; that is, when to modify demands as to the character of his lens.

We have often heard the purchaser of a lens ask for one of great rapidity and depth of focus combined, and unfortunately the anxious salesman is only too willing to meet his demand; but when the lens is called into requisition, it fails to satisfy in the two-fold compliance of combined virtues. Back it goes, and some other celebrated well-advertised instrument is substituted.

Clearly, no lens can possibly exceed another in depth of focus, because this cannot be made a special optical property, but depends solely on the proportion of the aperture to the equivalent focus, which proportion is the measure of the angle of the cone of light, and consequently of the diameter of the spot produced instead of a point.

While it is quite true that we must secure depth of focus by stopping down, it is easy to see that all the time we must be drawing on the rapidity of the lens. But more than this, there is another loss to be taken into consideration, with the advantage gained by depth of focus.

Suppose you take two pictures, alike in every respect but differently illuminated—one taken when the light was intense and with a small aperture of lens, and the other with, say, one-quarter the degree of illumination of the first exposure, and with a diaphragm of double the diameter or four times the area. The times of exposure being equal, what is the natural inference? Is it not that the two pictures would be identical? But such is really not the case. There is a very marked difference in the quality of the two pictures.

The larger the aperture, the richer the picture; and when the illumination is a mild one, that is, when diffused light is employed, as in our studio practice of portrait work, or if it be diffused landscape, we have a picture marked by a softness, yet at the same time, possessed of distinctiveness.

This character of the picture is caused by proportionate quantity of light employed, and the more this is the case, other conditions being harmoniously fulfilled, the nearer the photograph approaches a work of art.

In portraiture, the use of a large aperture in the lens is essential to artistic effect, because such an exposure allows sufficient light to enter of a character which does not flatten the image, but rather produces a pleasing illusion of relief upon a flat surface.

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Present-Day Printing

A great change has come over the practice of photographic printing with the almost universal adoption of development papers of the gaslight and bromide types, and we fear that the change is not altogether for the better. While it cannot be denied that the best examples leave little if anything to be desired, there is now a vast number of prints issued by good establishments which would never have passed muster when albumenized paper, carbon and platinum were the only media available. This state of things is due to a variety of causes, the principal of which is a lack of technical ability and knowledge on the part of the operator. The fashionable photographer of today is frequently by way of being an artist, and has entered the profession without the preliminary grounding in dark-room work and printing which came to his predecessors as a matter of course, and in the majority of cases has to rely upon the work of an assistant whose powers are often limited to producing more or less clean and even prints. In addition to this, we have to consider the uneven quality of the negatives which so often exists, consequent upon the practice of postponing development until long after the sitter has departed and the opportunity of correcting any error is past. When wet collodion was the rule, the quality of the negative was assured, and any that were not up to standard were immediately duplicated. Now we have to rely upon the printer to make good the deficiencies of the operator either by the choice of the most suitable paper, or, as a less satisfactory expedient, the modification by exposure and development of

a solitary brand; and printers who can do this successfully are few and far between.

The remedy for this state of affairs lies in the hands of the photographer; he must not expect from an assistant better work than he can do himself, and to this end he must thoroughly master all the printing processes he intends to employ. It is to be presumed that he has a clear idea of the effect he wishes to produce in his finished print and he should be able to produce it or to discover the reason for his failure. Having done this, he should instruct his assistants in his methods, and afterwards keep them up to standard. In former days it was a common custom for the principal to commence his day's work, often at an hour when the present-day artist is still in bed, by destroying ruthlessly every print of which he did not approve. This practice made for efficiency, as a printer could hardly expect to retain his position if any appreciable proportion of his work was regularly rejected.

The great variety of printing papers which are now available enable the photographer to obtain passable results with almost any class of negative, but it must not be forgotten that each has its peculiarities, and that perfect results must not be expected at the first attempt. It is therefore advisable to select two or three brands not necessarily by the same maker and thoroughly to master them. By this method the papers will receive a fair chance and a multiplicity of solutions will be avoided. The slower working varieties have not yet, we believe, been properly appreciated. Their capacity for giving a longer range of tones has been overlooked, as has their power of giving harmonious results from a vigorous class of negatives. In connection with this the strength of light to be used must be carefully considered, as neglect of this may lead to disappointment. Although theoretically a long exposure to a weak light is equivalent to a short exposure with a more powerful one, this is not the case when the light has to pass through a negative. With a dense negative and a slow paper it is impossible to obtain full detail in the high-lights before the shadow details are blocked up, and with a rapid paper and a fairly strong light it is equally impossible to get depth in the shadows before the lights are degraded. When using an ordinary printing frame this trouble may be overcome by varying the distance from the light, but in printing boxes, which are now generally used, there

is no provision for varying the distance, so that the light must be controlled either by using one or more bulbs as may be necessary or by interposing translucent screens to damp down the light. In some cases a thickness of ordinary white blotting will be found necessary for a thin negative, while the unscreened light is not too strong for a dense one.

We have mentioned these few technical points for the benefit of the operator who has given little thought to his prints, so that he may approach his task with some idea of the problems before him. And to emphasize the fact that the master craftsman must be able to carry his work through to a finish, we must refer to the practice of some of our greatest etchers, who are not content with etching and biting their copper plates, but laboriously print the impressions sooner than trust them to the most skilled trade printers. This being necessary with a subject composed mainly of distinct lines, how much more so must it be with the delicate tones of a photographic negative.—*The British Journal of Photography*.

A Word About the Acid-Fixing Bath

A paper contributed to your JOURNAL, or it may be an emanation from one of your editorial staff, looks somewhat askant and doubtfully upon the propriety of using the so-called acid-fixing bath. The article I especially refer to I believe was entitled, "The Abuse of Hypo." Now I do not intend in the least to controvert the arguments advanced by the writer that the virtues of hypo are tampered with frequently by noxious ingredients superadded to the bath intended primarily to do the effectual work of fixation of print and negative. Indeed, I am inclined to hold up his hands and support his contention, but the seeds of dissolution are sown in the print during its fixation, by the inimical action of certain chemicals associated with the hypo-fixing bath; but at the same time I firmly believe that the acid-fixing bath is a boon to the negative worker and can hardly be instrumental in the work of deterioration.

The acid bath has the sanction of the plate makers, and they hardly would recommend anything hostile to their manufactured commodity. Gelatine negatives are more delicate than collodion and, moreover, they are more prone to discoloration or yellow stain even when developing agents

are employed other than the stain-labile, old-reliable, pyrogallie acid.

As well as I can remember, plain alum was first employed. It is an acid salt and has a sort of tanning action on organic films like gelatine, but it was found not to work well, and at times gave the film an unpleasant opalescence. Alum, to be sure, does decompose the hypo and precipitate the dread sulphur, and our plates would sometimes show spots and blisters.

Now some one—I forget who—found out that the only acid which it is possible to add to the hypo without causing deposition of sulphur is sulphurous acid—I call to mind the discoverer was Prof. Lainer—and we ought to be grateful to him for his valuable discovery. Now, my contention is that a hypo bath which contains only the sulphurous acid, not only works no ill effect, but is a special boon to the profession. A bath compounded mainly on his formula will not only effectually fix the film without giving rise to deleterious agents, but at the same time harden it. To be sure, a good many of the formulæ published for making acid-fixing baths are not only needlessly complicated, but are loaded with useless chemicals, some of which are incompatible besides. The bath which I have used for years and which I keep corked up for immediate use shows no sign of change other than the black deposit formed on the sides of the bottle caused necessarily by the combination of the silver with the sulphur, but the solution is not contaminated with it.

Of course, the bath becomes somewhat weaker in action by repeated use and fixes slower, and should not be used to exhaustion. If this slowness of action should occur it would be unwise to continue its use, but it does not happen unless considerable call is made upon the bath.

The formula, which I have found to work admirably, is as follows:

Water	1 gal.
Sulphuric acid	6 dr.
Sodium sulphite (cryst.)	8 oz.
Hypo	32 oz.

Add the sulphuric acid first to the water. Add the whole of sodium sulphite at once and stir briskly for a minute or two. Now add the hypo—all at once, too. Do not wait for all the sulphite to dissolve, and keep up the stirring till solution is complete. When you add the sulphuric acid to the water it elevates the temperature of the water, but the sulphite and hypo quickly

added reduces this temperature almost directly. Let it stand, and it will presently look perfectly clear and colorless. It needs no filtration.

In summer time add an ounce of chrome alum previously dissolved in a pint of water. Grind the alum first in a mortar. This addition of alum hardens and preserves the film.—H. M. D.

Artistic Importance of Atmosphere

A photograph is an illusion produced upon a flat surface, and the illusion is accomplished by overcoming the suggestion of flatness or adhesion of one passage to another; that is, the artist deceives the eye by relieving the different planes of the picture, and this is best accomplished, and indeed can be effected in no other way, than by giving atmosphere to the subject. It is only thus that we attain the necessary recession of each particular passage and keep the varying planes in relation. Now, the painter, to be sure, has wider scope than the artistic photographer in securing this atmospheric effect, because if it is not present in the original it may be subsequently introduced for effect. So, then, the pictorialist with the camera is constrained to select a view which furnishes him with a number of naturally receding passages, and in no other way is this better accomplished than by working during the prevalence of a considerable amount of atmospheric haziness, where the eye, and, for that matter, to a considerable degree the camera's eye is led into the distance, traveling from one passage of the scene to another and giving rise to a pleasing deception by directing attention from the immediate foreground to the extreme horizon.

Even where the pictorialist is called upon to represent more confined than extended scenes, atmosphere will be found of artistic advantage even in single groups, because it supplies us with a corresponding background to that which we would have stand out pre-eminently; but, above all, atmosphere confers mystery, and mystery provokes sentiment.

Where a natural scene is presented in a strong glare of light, devoid of all atmosphere, our vision takes in at once all that is to be seen, and, being assailed by a multitude of objects and detail, it gets distracted rather than artistically satisfied; the mind really is deprived of the gratification of personally exploring the scene in search of that not directly apparent. So in photographic art, it does not do to reveal too completely the intention and purpose of our picture. We

must tell the truth, but not the whole, un-biased truth, for Art is deception. In interior work and with figure subjects, where all is close to view and atmosphere does not play so very essential a part as in landscape, mystery or poetic sentiment is frequently attained by obscurity in shadow of those parts not desired to show too pronouncedly.

One secret of the greatness in the painter's work is the mystery in the portions of the picture surrounding the principal incident, but in a photograph we must caution not to run into too great vagueness. It is quite possible to have a considerable amount of even careful detail, but you may so subdue it as to require a search for it. Detail is best repressed by control of the illumination of the shadows. It is only under rare conditions that blurring in the picture, whether from out of focus or otherwise, is allowable. Blurring never effects what real atmosphere obscurity does.

Mystery obtains only when we employ natural haze to entice it, or when, as in portrait work, we make use of broad masses and subdued shadows.

Peculiarity of Color Vision

There is one peculiarity about the generally accepted theory of our color vision for which no satisfactory explanation is offered. Mixtures of the blue and green sensations give rise to intermediate colors which might be expected, namely, blue-greens. Likewise blue and red produce purple, which certainly partakes of the nature of each. But the yellow produced by red and green seems to partake of the nature of neither.

But now it must be apparent that if the number of colors the eye is capable of perceiving is infinite, the number of colors in Nature does not separate us again as infinite.

Outside of the distinction between dilute colors and deep-hued colors, the eye makes no distinction of kind between colors. Even this distinction is a sliding scale in fact, if not in theory. For instance, most people would say that the difference between the blue and green-blue of the spectrum was the same kind of difference existing between spectrum red and pink, and these would not perceive that pink does not belong to the class of spectrum colors at all. We are not speaking of their perceptions from a reasoning point of view, but from the point of their color sense. In this connection it is interesting to note that the analogy with sound is not borne out.

Civilized man can perceive with nicety the intervals of pitch between notes struck on the piano. He recognizes the notes as monotonous (aside from nice distinctions of overtones).

The analogy is with that of the monochromatic spectrum colors.

But now strike several notes at once, and instantly he perceives that the kind of sound has been changed. He does not hear some intermediate or mean note as perceived in light scale, but a new complexity of sound or chord.

Composers with trained ears not only recognize that the sound is complex, but recognize also the exact amount and extent of the complexity and can state the chord struck.

As a matter of fact, there are no colors in nature which are perfectly free from white any more than there are any perfectly monochromatic colors.

When we speak of deep hues and spectrum colors we mean those that are very nearly free from white light.

Varnishes for Prints and Negatives

In making up a varnish or lacquer for the protection of the surface of silver or other prints, the photographer may be somewhat perplexed as to the kind of varnish to use, or the component parts for a suitable covering and their proportions.

The following special lacquer has been tried and found to be very satisfactory, although this particular varnish appears to be slightly turbid when first made, which does not interfere with the covering quality, nor does it produce any ill effect. The varnish will become quite clear in the course of time, when the clear portion may be decanted.

Tetra-chloride of carbon ... 2 fl. oz.
Benzine or gasoline 2 fl. oz.
Gum dammar 80 gr.

Unlike other varnishes, when benzine is used as a solvent there is no need of fear on the score of safety of this varnish igniting. The strong odor of benzine is greatly reduced by the introduction of tetra-chloride of carbon.

Formula No. 2 produces a varnish or lacquer that is non-ignitable:

Amyl acetate collodion 2 fl. oz.
Tetra-chloride of carbon 2 fl. oz.

The odor of bananas is also considerably reduced in this lacquer, as well as being perfectly safe to use when a flame may be near. This lacquer and the benzine tetra-

chloride of carbon varnish are intended to be used cold, while the following varnish for negatives must be used upon a warm plate and dried by heat. This negative varnish has withstood the test for many years. Negatives coated with it in 1875 and 1878 are in as good a condition today as when they were coated at that period, there being no sign of a crack, although the negatives have had a great deal of hard usage. Strange to tell, a negative that had been coated in 1878 had received a slight coating upon the top corner upon the glass side. This was cleaned off with a little alcohol, and the perfume of lavender became decidedly manifest as soon as the dried varnish was moistened, obtained from the oil of lavender used in the making of the varnish. The formula for this varnish is here subjoined:

Orange shellac 1 oz.
Gum sandarac 2 oz.
Venice turpentine $\frac{1}{4}$ oz.
Castor oil 10 drp.
Oil of lavender 10 drp.
Wood alcohol 20 oz.

The mixture must be kept in a warm place to aid the dissolving of the gums, and shaken occasionally during twenty-four hours. It may then be filtered or allowed to stand to permit any foreign matter to subside, pouring off the clear portion for use into a separate bottle.

Subsidence will produce a much clearer varnish than filtering. Of course, time is required for this, from four days to one week, will be the only time required to permit of perfect subsidence. Warm the negative, coat and dry by heat.

"Printed-in" Backgrounds

There are numerous plans suggestive of a proper combination of landscape or interior backgrounds with the portrait taken in the studio, but in the adapting of such devices one matter of considerable importance is frequently lose sight of or looked upon as of secondary interest; that is, the harmony and suggestiveness of the background and accessories to the figure itself. There is a difficulty attending the performance, and one greater than at first thought might be supposed. It is very easy to say, get the different elements in harmonic relation, do thus and so, but when one undertakes practically to carry into execution the suggestions offered he finds innumerable factors presenting themselves,

especially more numerous if the photographer happens to be a man of artistic taste and judgment. If relations are not secured between the model and the background setting, no matter how skilful the joining of the parts may be, the result artistically is bad; worse, indeed, than when no relation is attempted, and we make use of a plain, uniformly illuminated background.

The axiom prevalent in art talk that a picture must be suggestive—that is, leave something for the imagination to build upon—is especially applicable to the photograph of artistic pretention. In addition to what is particularly definite we must have portions considerably less definite, if not even passages which are obscure. A photographic portrait must affirm the familiar expression that it should “grow on you.” If it does not grow on you—that is, appeal to your imagination—you are apt to call it commonplace.

To get the proper relations of model to its background no plan is more effective than that known as double printing, or printing in of the background from separate negative. Indeed, artistic excellence is hardly possible in any other way.

There is considerable trouble attending the correct manipulation of such a method, but the expenditure of pains is well repaid in the results secured.

Mechanical skill, fortunately, is not the sole requisite in photographic portraiture. Expression of individuality is also demanded. Almost every pose requires some alteration of lines of the background to secure the artistic effect.

It is just here that the taste and judgment of the artist comes into requisition in the adjustment of the proper negative background to the model. Fortunately, the photographer has nowadays at his disposal background negatives of artistic beauty and of special application to almost every variety of pose. But he must bear in mind that no matter how artistically beautiful the landscape or interior may be, he must look chiefly to its proper adaptability.

The landscape ought never to usurp the attention to the slighting of the figure or group. It must be kept in due subordination, though not necessarily slighted. It must be studied in the formation of its lines as related to the lines of the figure. We might say here that in our judgment it is next to impossible to get a full-length figure in due relation with the combined background, and so such poses should not be attempted. The difficulty lies in adapt-

ing the foreground. The union always has an unreal look, and advertises palpably that the process is a dodge or fake. Three-quarter views are better managed.

In selecting a landscape setting the view must be such that the lines of the perspective of the scene converge to a point on one or the other side of the figure, if the figure is placed centrally, but if the center is left open, the point of convergence is better placed there.

We ought to mention that all negatives are not adaptable to this method of double printing. Most negatives are entirely too dense, and any attempt to employ them would result only in failure. The background negative must be particularly thin, but this does not imply that the print therefrom should be only slightly indicated. It ought to be of sufficient depth to harmonize with the lights and shades of the figure. The head of the figure should be relieved against the sky part or against the fainter defined objects in the background.

Transferring P. O. P. Prints on Fabrics

The facilities of being able to transfer photographs made on P. O. P. paper do not seem at the present time to be taken advantage of as they might be, the fact being, perhaps, the reverse result that is obtained, or it may be careless working, and so spoiling the results. Anyhow, for the sake of those who feel disposed to try their hands at what may be called a very decorative process, the few particulars set forth here may be helpful to some degree.

So far as the print is concerned, there is nothing more than the carefully printed and toned picture, but no hardening bath of any description must be used; if it is, disaster will probably follow. If possible, transfers should be made with prints from the last washing, or the prints may be dried as usual and used at a future period; but previous to a dried print being used a thoroughly good soaking in water must take place, and for winter work it should be about 55 degrees to 60 degrees. In the summer this will not be necessary, the working temperature being fairly high.

The transfer of the whole print from its paper support does not in the strict sense of the term take place, nor must it be looked for. What really happens is that a good deal of the gelatine is absorbed by the fabric, leaving some of the gelatine upon the paper when peeled off. A paper introduced some years back could be transferred to any object

one wished. It was prepared with a substratum which was easily dissolved, between the gelatine and the paper, but my experience with it was that it came away too easily and at times when it was not wanted to.

The fabric for the permanent support of the image may be silk linen, but for ease in working sateen is hard to beat, being a very absorbent material and obtainable in almost any color, while at the same time is not costly.

If the fabric has a dressing which would repel moisture in any way, washing thoroughly in water, drying and then ironing out with a warm iron, to get it flat and free from creases, will be necessary.

A piece of the material is now taken an inch or two larger than the print, and carefully pinned by its four corners to the cloth of a small ironing board, previously arranging to have an iron made hot, as if ironing was about to take place. Any sort of iron will do; it should be hot, but not hot enough to singe or burn.

The print should, for convenience (although not necessarily), be printed with a white edge, similar to a carbon safe-edge; it looks better, the finish is much superior and the gelatine is not so liable to run when the heat is applied.

The print is carefully taken from the water in which it has been thoroughly soaking, all moisture is removed from its face and back with some old linen or blotting-paper, and it is carefully laid face downward upon the fabric. Now run a roller squeegee over it, and then lay a piece of white blotting-paper on the back, with just enough glycerine to make it moist, but not wet. Over this lay another piece of dry blotting. Now with your hot iron go over the back carefully, pressing the iron as if ironing. Then, without hesitating for one moment, take away the blotting-paper, lift the two opposite corners of the print and peel it away. If everything has gone right an excellent impression of the print is the result, the gelatine image having been incorporated with the fibres of the material, which may be now unpinned from the cloth on the board and placed on one side to dry thoroughly.

In conclusion, I may say the interest does not always finish with the ironed print. The surface of the fabric so treated is well adapted for coloring, while, again, colored fabrics lend themselves admirably to subjects if photographed with dark backgrounds: they allow the ground color of the material to take the predominating color of the subject.—The British Journal of Photography.

Transmutation by Mild Action

We have been accustomed to look for transformation of any body of accredited stability, by the application of some energetic force, such as high temperature, electrical potential, etc., but it is now practically demonstrated that matter resistant to the influence of mighty agents may be made to yield to the soft, persuasive influence of slight exertants, the only condition being compatibility in the relations.

Such a feeble excitant, for instance, is a mild ray of light, as in our photographic processes.

Indeed, photography, if it had been studied earlier in a scientific way, might long ago have revealed to the investigator what he is now taking particular note of.

Dr. Le Bon has pointed out the important part played by mere traces of a foreign substance when added to a body.

Aluminum, when cold, does not decompose water, nor does it oxidize at ordinary temperatures, but it can be made to quickly oxidize when cold, and also to decompose water simply by addition to it of a mere trace of another body. For instance, if we put the aluminum in the presence of a mere trace of mercury, the washing out of an empty flask which has contained mercury, it becomes possible so to modify the character of the aluminum that, if classed according to its newly acquired properties, its place in the list of the elements would have to be changed, that is, it would not be recognized as aluminum at all.

Metallic magnesium behaves in a like manner.

The two metals after an infinitesimal contact with the mercury decompose water with violence and become oxidized instantly in the air, being covered over with thick tufts which grow while you look at them, like a kind of vegetation.

Have you not a right, from this, to conclude that their fundamental properties have been materially modified?

By extending these researches, many other facts of the same order might be discovered.

Nothing could be more unlike in physical and chemical character than ordinary phosphorous and amorphous or red phosphorous. In certain of their chemical properties they are as distinct as iron and sodium, yet all that is needed to change white phosphorous into red is the addition of a mere trace of iodine or selenium.

These facts seem to prove that simple

bodies have not the invariability hitherto ascribed to them, and this once admitted to intimate that it is possible to transform the elements.

"The great modern discovery to be realized today," says M. Moissan, "would not therefore be to increase by a single unit the number of our elements, but, on the contrary, to diminish it by passing in methodical fashion from one simple body to another." Shall we finally attain that transformation of simple bodies into one another which would play in chemistry as important a part as the idea of combustion when grasped by the acute mind of Lavoisier?

Great questions stand here for solution, and this mineral chemistry which we thought to be scientifically exhausted is yet only at the dawn.

In reality, on the modern theory of electrolytic dissociation, chemists are obliged to admit, as every-day occurrences, transmutation quite as marvelous as any dreamed of by the visionaries of the Middle Ages, since it suffices merely to dissolve common salt in water to entirely transform its atomic structure.

Finish

A picture in the broad sense of the term is the result of a species of deception. "The truth, the whole truth, and nothing but the truth," is not admissible in art. But while this deception if not ethically justifiable is esthetically permissible, one must not forget that our vision can be deceived only up to a certain point, and so the question is where to fix that point.

The modern schools of art are well agreed that elaborate finish is undesirable, though some artists insist that uniformity of surface or smoothness atones for bad execution. Intelligent finish consists in correcting small faults of detail, in revising the relative values of the shades and half-tones, in giving definiteness to parts which need to be expressed clearly, instead of blurring by imperfect focus as happens sometimes in delineating the fingers of the model. Unless the portraitist can work with precision and so light the model that the minutiae is not self-assertive to the loss of breadth of expression, he must not be too literal in the rendering. But on the other hand, sketchy and imperfect work is objectionable, no matter how much such a picture gets talked about in the salons or praised in the magazines while good, honest work is ignored.

Enlarging Negatives

The enlarging of a negative without the use of a camera applies mainly to the smaller class of photographs, such as a 4 x 5 or 5 x 7 glass negative. The operation is extremely simple.

In the event of the negative being somewhat dense in character it will be found that the stretching of the film has reduced the density to about the right printing quality.

The film of a 4 x 5 negative, when treated as described, will enlarge to 5 x 6 and a 5 x 7 will expand to 6 x 8, so when it is found advisable to enlarge the negative to this size it can easily be accomplished.

The mixture for this work is the same as for the stripping of a gelatine film from a glass negative, which is fully described here.

The writer has enlarged a negative on several occasions by this plan, and it was by using this method that the discovery was made that an overdense negative became a negative of good quality by the expanding of the film in the process of enlarging. In making up the solution it must be remembered that the commercial fluoride of sodium is used, not the chemically pure. The commercial fluoride costs about 15 cents a pound wholesale, while the chemically pure article may cost as much as 25 cents per ounce. Make up the following solutions, as soon as the negative is ready. If the negatives have been fixed in the chrome alum acid-fixing bath, that is all that is necessary to insure the film from splitting when it is in the water for the swelling process. If the negative has been fixed in plain hypo only then it will be necessary to place it in a chrome alum bath of half an ounce of chrome alum to 20 ounces of water. Place it in this for 2 minutes, then wash well and dry before stripping. The stripping solution is made as follows:

A.

Fluoride of sodium 1 oz.
Water 16 oz.

B.

Sulphuric acid ½ oz.
Water 6 oz.

Add the sulphuric acid to the water when mixing, allow it to become cold. Take 8 ounces of A solution, add thereto 4 ounces of B. Place the glass negative into this mixture in a hard rubber tray. Rock the tray. As soon as the film becomes loose, lift it from the plate and let it float in another tray of clean water. Assuming that

it is a 4 x 5 negative, the film will very soon expand until it has increased in size to 5 x 6. A clean 6½ x 8½ plate must be at hand, over the surface of which a small quantity of gum arabic has been applied, then rinsed under the faucet and slid carefully beneath the expanded film, lifting it carefully, at the same time gripping the film and plate and withdrawing them so that the water slides off the plate leaving the film in the center. By directing a gentle stream of water upon the film, it can be flattened out without the use of a brush. A piece of paper may now be taken and wetted and laid upon the adjusted film and a squeegee applied in the form of a thin strip of cardboard. When all the water has been removed by the squeegee, the paper must be carefully lifted so as not to disturb the film and the plate laid horizontally to dry. When dry it may be varnished or not, and it will be ready to print from.

Product and Price

Photography as a profession is somewhat on a line with the painter's or physician's profession. It is necessary to maintain it on a high plane of dignity, although it is as much a trade as an art, and so we must consider the relation existing between the public and the photographic artist if we wish to establish on economic principles the contention for adequate remuneration. The duty devolves on us of maintaining the dignity of our profession and of getting equitable return. It will be found that the most successful photographers in a business sense, are those who take into consideration the question of justice and equity in regard to their patrons and themselves.

There are so many conflicting interests and varying factors confronting a discussion of prices and equity, that it is difficult to formulate a scheme that shall be just to all or even to the majority; and then there are those circumstances which affect peculiarly each locality. Any scheme of uniformity of price evidently would be not only practically impossible, but if possible, unjust. Prices must vary with locality in the same way that styles of work vary. Every one knows that a dollar in an inland town of 10,000 inhabitants is worth a good deal more as an exchangeable medium than it is in a city like New York or Philadelphia. It buys less and has a much smaller relation to the wealth of the community in a big city than in a village. So really

it is necessary for every one who enters into the photographic business to have his judgment unbiased and free from prejudice, so that he may determine in what relation his work stands comparatively and to regulate his prices accordingly. To be sure, comparisons are odious, sometimes extremely mortifying to the self-examiner, but it may be salutary and become a stepping stone to a higher plane. If you discover that your work is not up to the standard of excellence of your rival, you have no right to charge what he charges. If you do you will be acting dishonestly. This is the equity of the question, the ethics not to be considered. "Honesty is the best policy," even if we practice it only because it is a policy.

But then, if you find that your work is quite up to or even above that of your rival's, you are just as dishonest, though you alone suffer. You are where you put yourself in your profession.

Low prices degrade any profession, and ultimately lower the standard and ruin trade. By cheapening you advertise that the valuation of your work is insignificant. You have plenty of evidence of what competitive cheapness has done. You must keep in mind the difference between your profession and an ordinary trade. You have none of the advantages of the ordinary tradesmen who are on an equality. Each gets the same advantages as his rival, because his position is identical.

Every photographer should, like the physician, count as asset his personality. Where a certain photographer's work is admired and sought after no mere difference in price, such as prevails in our profession, will ever cause a loss of patronage. On the contrary, it will tend to increase patronage.

Learning by Imitation

Sir Joshua Reynolds, in his lectures to young painters, says: "The greatest natural genius cannot subsist on his own stock; he who resolves never to ransack any mind but his own will soon find the pasture bare and that he is feeding on a moor. To imitate oneself is the worst practice. He will repeat what he has before repeated."

Invention, strictly speaking, is little more than new combination of those images which have been previously gathered and deposited in the memory. Nothing can come of nothing.

The highest demand that can be made of

the artist is this, that he shall hold up to Nature the mirror; study her; imitate her, and seek for the reproduction of her manifestations. Even the best painters succeed through instinct and taste, through practice and continued trials in approaching the outward beautiful side of objects, in choosing the best out of the good, and so, at last, learn how to produce an agreeable appearance. How much more rarely does it occur that the artist is able to penetrate into the depth of his own mind as well as to take the measure of outward objects, and thus instead of producing of merely superficial effect emulate Nature herself?

This may not be within the scope of photography, of course, because the photographer deals solely with material presentations and has very little scope for idealization, but that photography is susceptible of embodying the higher elements of true art, the works of today, which express so much of poetry and sentiment, the work it produces bears evidence. The general culture of the times makes certain demands on art, and the true progressive artist will, in a measure, at least, direct the taste and put the stamp of his individuality upon his work.

Photography has entered the field of art and no one can deny its rapid progress not only in the development of its own wonderful capacities, but in stimulating among all classes a love of art, and creating a demand for artistic work, which, after all, is one of the greatest incentives to those efforts for excellency which marks all progress toward the goal of perfection.

The Scale of Light in the Photograph

We have heard many a one, whose words give evidence of considerable knowledge of Art, maintain that the rendition of a natural scene by photography in monochrome is dependent for the translation in adequate terms of the color values solely upon the ability of the person who makes the exposure and develops the plate. We cannot subscribe to such a dictum without some qualification of the rather broad assumption. It claims too much for photography, notwithstanding our faith in its qualifications. To be sure, we are often provoked to maintain the potency of our art in reproduction of actual things, more or less in their true relation, when assailed by the rather provoking assaults upon it by the painter; nevertheless, one is constrained in all fairness to acknowledge photography's shortcomings when called upon to render in monochrome any subjects

of a specific character with any approach to the truth to Nature which presents itself in a well-executed sepia water color, an engraving, mezzotint or etching.

Outside the question of the inability of the gelatine plate, or any other medium of photographic practice, for that matter, to reproduce the scale of color in Nature with any approach to truth, we must be candid to acknowledge the inadequacy of even the best of the orthochromatic methods.

The photographer is constrained, therefore, to compromise if he has any eye for the art value of his picture. He will never select subjects for reproduction which shall show tendency to give false representation by reason of the peculiarity of color or illumination. He will avoid such as have a great range of light and shade, where the highest lights are a greater number of times brighter than the shadows, and simply because they are ineffective, notwithstanding their artistic appeal to him.

Such natural subjects are at the best unsatisfactory, as is evidenced by the majority of photographic views of mountain scenery, with snow-clad peaks bathed in the strong light of the sun, with steep, rocky slopes clothed with the foliage of dark pines. However lovely to the eye, they invariably disappoint our expectation. It is vain to expect, even by skillful manipulation, to preserve the true scale of light and shade, or even to approximate it. We confess the superiority of the painter's transcript.

In selection, therefore, it is essential to prefer subjects where the sun illumines the shadows as well as the prominences, so as to avoid excessive, unnatural contrast. Not only in landscape is it advisable to pay attention to the particular character of the illumination as to its adaptability to our art of photography, but also to regard with consideration any means of modification when treating subjects more immediately susceptible of manipulation, which we encounter in our practice in portraiture or in artistic interior work where the constrained conditions cause illumination too violent for effective artistic photography.

It is fortunate for us of artistic perception that the bright things of Nature, the gorgeously arrayed landscapes, for instance, do not affect our vision proportionate to their intensity of illumination; that our eyes get only a faint or much modified impression, and our artistic sense determines the legitimacy of falsifying, so to say, our efforts at reproduction of the actual scene or object.

This concession is ungrudgingly accorded.

the painter, and why should it be denied the photographer, especially when he is more constrained by reason of the means and media of artistic expression? We believe that dodges or devices of any kind during exposure or development or printing are legitimate, so that we get the photographic reproduction to approximate the scale of light and shade afforded our artistic perception, but keep back our assent to any illegitimate practice which obliterates the product of the camera by the skillful transformation with the artist's brush.

Some Practical Background Suggestions

The photographic artist, in his endeavor to secure atmospheric effect in his portrait studies, spoils the harmonic relations of model and background setting by throwing the painted background too much out of focus. Such a procedure, to say nothing else, is not fair treatment of the good points furnished by the landscape scene. You employ a good artist to put atmosphere in your background view, and then you think it incumbent upon yourself to sophisticate it. It is safe enough to place a properly painted background near enough to the model to show its good qualities as a landscape.

Backgrounds are frequently abused and unjustly condemned simply because they are misapplied. A scene constructed with the horizon so placed as to give natural and pleasing effects with a standing figure will give unnatural-looking effects when you use it behind a seated figure, especially if the subject is placed low. Sometimes fault is found with a background when the only fault is in the inappropriateness of the illumination of the scene associated with the illumination of the studio model. Sometimes the illumination (that is, the light in which the landscape is seen in the studio) is too bright for the character of the subject. If you wish to depress the light it is simple enough to slightly veer the background at an angle from the source of light, and on the contrary, if the scene is not bright enough, turn it more toward the source, even at the expense of some loss of detail.

Backgrounds, presenting patterns, designs or straight lines, may sometimes be used effectively with standing figures, but such are always out of place and distracting artistically when a bust or a head is taken.

Baseboards in interior views should always be excluded, because they are so apt

to catch the high-lights and come out too pronouncedly in the picture.

Speaking of interiors as settings to the model, that is, artistic backgrounds, with columns, etc., remember that consistency in lighting is absolutely necessary. The light on the model should seem to come from the window or open door and not show that it is from the top light of your studio. Vertical lines are objectionable, especially where they apparently intersect the figure in the center of the head or at its side, or may be upon a point at the shoulder.

Horizontal lines should not be allowed to cross the figure anywhere above the waist line.

Diagonal lines are sometimes well worked in as falling shadows or lines in the architecture, but they must not intersect the figure at the point of the shoulder, elbow or waist.

Miniature Photographs

Miniature photographs find manifold application in all kinds of novelties, such as penholders, charms, and other trinkets, but the majority of what we see is so bad that one does not wonder at the decline of taste in this interesting branch of work. We have seen minute photograms, hardly the dimensions of a pin's head, showing over 400 portraits distinctly, when microscopically examined. This shows that microphotographs might be of considerable importance.

The main point is to get a sensitive film without a grain to it. Of course, gelatine is out of the question on account of its large grain of structure. Collodion is finer in grain, but still too coarse for such delicate work.

Albumen is the only medium applicable.

The following formulæ are recommended:

A.

Alcohol	1½ oz.
Ether	1 gr.
Soluble cotton	16 gr.
Ammonium iodide	16 gr.
Tincture of iodine	17 drops

B.

Take 160 parts of fresh white of egg, mix with 1 part glacial acetic acid in 20 parts water, avoiding formation of air bells when stirring. Let the mixture stand for 2 hours and pour off the clear portion.

A thick film will separate from the lower clear liquid, which is removed.

The next preparation is:

The above white of egg ... 6½ oz.
 Ammonium bromide 4 gr.
 Ammonium (strong) 15 drops
 Ammonium iodide 18 gr.

Coat the thin piece of microscopic glass first with the collodion and wash it until all greasiness disappears from the surface, then coat with the albumen preparation (B). Place the plates edgewise to dry in a place free from dust. When thoroughly dry they keep indefinitely.

The sensitizing solution is made as follows:

Nitrate of silver 154 gr.
 Glacial acetic acid 1 dr.
 Distilled water 3½ oz.

When the film becomes opaque, or rather opalescent, wash in distilled water and dry.

Development is effected with concentrated gallic acid, to which is added a few drops of 1 per cent. solution of nitrate of silver acidified with citric acid.

Nitrate silver 15 gr.
 Citric acid 15 gr.
 Distilled water 3½ oz.

Fixing and toning is done in the following bath:

Chloride of gold 15 gr.
 Chalk 60 gr.
 Hypo 120 gr.
 Water 14 oz.

The tone is purple brown to black.—
 Photo Wochenblatt.

Heart Photographed by Own Electricity

Although constantly in motion, as it alternately fills with blood and squeezes it out of its cavities, the heart of the living person can be photographed, and is often pictured for medical purposes by means of the X-ray machine.

The lungs, by which the heart is nearly surrounded, contain a considerable amount of air and the X-rays pass through air with ease. There is no air in the heart, and this organ and the blood it contains obstruct and absorb the rays, so that a shadow, different from that of the lungs, is thrown upon the photographic plate.

Another means of picturing the heart, or, rather, a way of taking moving pictures of this fine force pump, has been invented. The instrument is known as the electrocardiograph or electric-heart-picture machine. Electricity made by the heart itself is used to produce the photograph.

When any muscle contracts an electric

change is created. The heart is a powerful muscle, and when it beats or contracts an electric wave starts at its base and sweeps to its apex.

By placing the right hand on one metal plate or electrode and the left foot upon another, the current created with each beat of the heart is carried off through wires and into a very delicate instrument, where, by means of magnets, wires, mirrors and a moving photographic plate, a diagram is secured of what is going on in the heart.

Not only does the picture show the mere rate and force of the beat of the heart, but it tells much as to the condition of the heart muscle and whether the valves close properly.

In other words, it gives us new information as to whether the heart is healthy or diseased and as to the nature of the disease.

This new and very expensive instrument is being used to some extent in some large hospitals. Though it may picture the behavior of the diseased heart, it is quite another matter to help that organ back to health. The best that can be done is to give it a rest by reducing the work thrown upon it below what it can easily do.

If not overworked or not embarrassed by other indiscretions on the part of its owner, a leaking heart will usually last to a good old age, but science knows no way of taking it out and making it as good as new.

Range in Selection

The photographer, more than the painter, is hampered in securing effect by reason of the difficulty encountered in modifying or reconstructing unpleasant forms and the getting rid of obtrusive lights. Ill-shaped and angular forms violently contrasting in light and shade mar many an otherwise good piece of work with the camera. The aim of the pictorialist should be to modify such as far as possible. The range of selection is not as great with the pictorial photographer as with the painter. Indeed, the photographer often has to forego the taking of a well-composed scene simply because he is unable to eliminate objectionable, obtrusive features. The trouble with the pictorialist in selection is in his, let us say, greediness to bag the beautiful in Nature. He ought rather consider that he has no right to presume upon the ready facility he has of chronicling what appeals to him for its attractiveness in some few particulars.

He may not consider the cost of an extra

exposure of much consequence, but it is a dilution of his artistic resources and a means of weakening his ability to artistically select when he tries to be prolific in pictorial work. The painter is satisfied with one picture, where the cameraist is disappointed when only eight out of a dozen exposures are works for the salon. We ought to remember that even Nature, prodigal as she is in many ways, is not too lavish in her display of pictures. We should take consolation in the knowledge that what is rare is more highly prized than what is common, and that it is better to repose with a single laurel crown gained by one superb work than to obtain questionable or qualified reputation for a host of pictures of mediocrity.

Tone and Gradation

"Tone" is a word which is used by the art critic with considerable looseness of definition, often hardly to be distinguished from his idea of harmony; but if this confusion of terms is laid to the charge of the painter as contributory to ambiguity and confusion of meaning, what a charge in the same direction may we not bring against the photographic art critic.

Tone is not only confounded with what really is to be expressed as the harmony of a picture, but is indiscriminately applied to the particular monochrome color of the photograph.

Almost in the same paragraph we find the critic talking about the tonal harmony and the sepia tone of the print much to the distraction of those who are not familiar with the technical photographic application of the word tone.

Perhaps no great harm is done in the way of false impression to us photographers, if we shall keep in mind, as any one does in ordinary conversation, the difference in signification of identical words of our language. But when the critic comes to speak particularly of the tonal values he should have a care to emphasize the particular and specific art application as distinct from the technical. Artistically there is a distinction between tone and harmony. The words are by no means synonymous.

Harmony is the relation of qualities; tone the relation of quantities. Both tone and harmony must persist in a picture, they are inseparable and most intimately related. It is doubtful if tone is possible without harmony or harmony without tone.

An appreciative eye doubtless would feel the lack of tone in a picture without really

knowing that the deficiency was due to the lack thereof. That is to say, such a one sees tone without recognition that such is tone—just as in the same way a good but uncultivated ear for music would detect a redundant note or a false rhyme or defective rhythm in a poem. So you see that tone is important, for a picture out of tone is just like an orchestra out of key, though it might take a skilled musician to point out where the discrepancy is. There is a close relation in all fine art. The artistic vision is as sensitive to incongruity of light and shade and colors as is the refined ear of the musician.

Tone demands all the notes to be in accord, and pictorial tone likewise requires the same accord in the scale, a sort of leading up of the individual elements to the dominant key of the picture where the object is illuminated by a uniformity of light, that is, where all its parts are of equal brightness or sombreness you have the tone of it, but supposing you so place that object that it receives, from the character of the illumination different degrees of gradation of light and shade portions of it will appear in full color intensity where the strongest light falls, parts in half-tone or tint, and parts in shadow and deep shadow.

Tone, therefore, is of a simple nature when in uniform light, and requires only a resemblance in quantity of tint, but it becomes complicated when different lights and shades are introduced, and then demands gradation of tint passing from the dominant or keynote of color downward.

It does not matter whether the color of a picture be vivid or sombre, provided the quantity be so regulated as to get the gradations, for tone is dependent upon proportion, not upon depth or intensity. A picture may seem to one not trained to appreciation of tone to be dingy or faded-looking, and such a one is surprised to hear an artist speak of its excellent tone. Or he may turn away from another picture as too flaming in color for his taste, yet it may also be good in tone, because it preserves the scale of gradation and interchange of relations from high to low. A picture may have a preponderant grey tone, and we then speak of it just as we do of a musical composition as having a low tone, and, on the other hand, a vivid scene, bright with scarlet and yellow, may possess beautiful tone and be dominated high. The colors in both cases give the respective tones by reason of the gradations from the central light into the deepest shadows, and the

one may have just as many gradations as the other, though they produce a different emotional sensation.

It is perhaps more difficult to judge of the tone of a picture of the sombre variety than of the vivid kind, because our eye has not been educated to appreciate to the same degree low tones as it has high tones. When the light falls on an almost colorless object you do not so easily notice the nice gradations, because the bright coloration in another object gives the eye guidance.

In trying to judge of the tone of a picture it is best for you to look for the part of highest illumination, and make it the keynote from which to run down the gradations. That is, get the pitch and it is surprising how soon you shall begin to notice any discord. Of course, you will not find every picture true in tone, and so in judging of an artist's work you must not be too exacting, because it is only the masters who approach the proper rendition of the scale of gradation. But such a study is most valuable to the photographer and he should experiment under different kinds of illumination, but never attempt any bizarre lightings, such as Rembrandt effects, etc., until he has most thoroughly trained his eye to note the imperceptible gradations from the highest note to the lowest.

The Latitude and Development of Dry Plates

The latitude of most modern plates (I have experimented with five different makes) is truly remarkable, the word "latitude" being defined, of course, as "the range of length of exposure which may be given to a plate under any given conditions of stop and subject to produce a good negative." Experimenters, as a rule, devote their attention to the remedying of over-exposure, or, rather, to the point to which one may over-expose, yet get a really good print from the overdone negative.

My own rather rough experiments were with plates of what one may term average over-exposure, such as any practical worker may meet with. I saw no object in purposely over-exposing enormously and then, in some special way, getting the best printable negatives possible from such exposures. It was everyday work I had in mind, and in everyday work one does not over-expose "enormously." An over-exposure of three or four times is, I think, all an average worker makes accidentally, and although I have in front of me passable—I may even

say good—results from plates over-exposed twenty to thirty times, I do not consider them to be of much interest to practical workers, except, of course, as curiosities. Such exposures were known over-exposures, and were treated as such in developing, a process differing materially from that of the treatment of unknown over-exposures, since most of us are not aware of over-timing until the developer starts its work.

My principal experiments were carried out with five different makes of plates, having speeds of between 250 and 350 H & D, medium speeds, such as I believe the average worker uses. The accurate exposures given were the result of many years' experience, such exposures being endorsed by three exposure meters, and when there were differences—as there were at times—between the readings of the meters, the mean was taken. The subjects, it may be said, were a still-life set-piece and an architectural subject opposite my place of business, the camera being set in an upper window during the July spell of cloudless days, when the light at midday was as constant as it could possibly be in England.

I found that I might over-expose six times, and by using a normal developer, could get negatives which gave perfect prints on self-toning paper, and that by altering the developer to suit the extent of over-exposure, I could get really good printable negatives from plates over-exposed as much as eighteen times. To my way of thinking, the task of over-exposing enormously and making up the developer to counteract the over-exposures, is one for the laboratory alone, whereas that of getting the best negative from an unknown over-exposure when using a normal developer is one all average workers may have put before them, and it is interesting to know what can be done under such circumstances. A studio or out-of-doors operator must be very inexperienced to so misjudge light or subject as to over-expose more than six times, though I have known experienced workers to do it by calculating an exposure for a small stop and forgetting to insert it, thus using the lens in error at its largest (and focusing) aperture.

Present-day methods of developing a plate found to be over-exposed, I believe, vary considerably, but in days gone by it was the custom to add a good dose of bromide, or to increase the amount of the density-giver, usually labelled "No. 1," the "No. 2" solution being the accelerator. Increase of the density-giver after the developer has started

work may have some beneficial effect, but the practice of adding bromide after development has started was abandoned long ago by expert workers, because it was proved to have no effect.

The secret of taking advantage of the great latitude of modern plates, and of success in developing over-exposures up to six times, is to use a normal developer with the average amount of bromide, ignore any sign of over-exposure and the appearance of the image, and develop for the same time as one would develop a correctly exposed plate, thus throwing factorial development overboard for exposures other than the correct one, and adopting tank development—in theory, if not actually in practice. Tank development is unquestionably the best for all under- and over-exposed negatives, and although I rarely use a tank, I always use the system, but employ a dish.

There can be a no better or no more instructive experiment than to expose four or more quarter-plates for varying times beyond the normal, and to develop them all at one time in the same dish, along with a correctly exposed plate, keeping an eye on the latter and ignoring the others. The finished negatives will, of course, vary in appearance and density very considerably, but they should, if properly printed, give good results—so good that it would be a very difficult matter for the uninitiated to tell the prints from the over-exposed plates from that correctly exposed.

If negatives less dense and of a more even appearance—but of little or no better printing quality—are wanted, then altering the composition of the developer to suit over-exposures will give them, but in order to secure the best results the approximate amount of over-exposure should be known. Assuming a normal two-solution pyro-soda developer is used, over-exposures up to four times may be counteracted by using equal parts (normal developer) and adding bromide (before applying the developer) up to, say, four drops of a 10 per cent. solution to each ounce of working solution, but for over-exposures above four times, which should be rare in everyday work, one must start increasing the density-giver (No. 1) as well as the bromide. This increase goes on as the exposure increases, and I have found that for a known over-exposure of twenty times a developer consisting of 2 ozs. of No. 1 and 1 oz. of No. 2, with 15 drops of a 10 per cent. bromide, to give a good negative. This particular work, however, is beyond the scope of the present note.

The work I set out to do was to find out how far one could take advantage of the great latitude of modern plates without altering one's developer and method of working.—L. Tennant Woods in *The British Journal of Photography*.

Two-Color Cinematography

A process described in a patent specification (No. 165,826) of (the late) W. Friese-Greene and Color Photography, Ltd., is of that type which consists in preparing pairs of negatives on a single light-sensitive surface, such as a cinematograph film, by exposing them in succession respectively to direct white light and through a colored screen, preparing positives therefrom and thereafter coloring the positives so obtained (for projection) or projecting them through colored screens.

According to the invention the exposure through the colored screen is made through a screen colored yellow, as for example through a screen colored with flavazine.

For the purpose of projection in color the entire positive surface obtained from the negative exposed directly to white light is preferably colored approximately blue-green or is projected through an approximately blue-green screen, and the other positive surface is colored, or is projected through a screen colored approximately orange-pink or other color of reddish-shade.

In the preferred method of carrying the invention into effect, the cinematograph film is specially color-sensitized as described in Patent No. 134,238 ("B. J.," December 12, 1919, p. 728). Alternatively, any other preferred form of panchromatic film may be employed.

The film is exposed in an ordinary cinematograph camera, fitted with a special shutter by means of which alternate exposures are made direct to white light and through a colored screen or filter respectively. For this purpose either in front of or behind the usual shutter in the camera there is a disc of celluloid, which is stained over one-half with the required color for the colored filter. The other half is preferably opaque, and has in it a narrow slit. The disc is revolved with the shutter of the camera to expose successive portions of the film, alternately to white light and through a color screen. The ratio of the width of the slit to that of the stained surface of the color-screen is conveniently 1:5, so that the picture taken through the slit is very

sharp, and that taken through the color-screen is not quite so sharp. The result of this is that when the pictures are projected, the flickering usually experienced with motion pictures in color is considerably reduced.

In the preferred form the color-screen is made of transparent celluloid coated with gelatine containing flavazine by the use of the following dye solution:

Flavazine 1 oz.

Water 10 ozs.

in which the screen, previously coated with gelatine, is immersed until it obtains the required color density.

After the film has been exposed, it is developed in the ordinary way, and a positive is prepared therefrom. The alternate exposures are then colored as already described. The colored film can then be projected from an ordinary cinematograph apparatus.

For coloring, the following solutions are preferred:

For the blue-green positive:

Victoria blue $\frac{1}{4}$ oz.

Patent blue $\frac{1}{4}$ oz.

Naphthol green $\frac{1}{2}$ oz.

Water 10 ozs.

For the orange-pink positive:

Rose bengal $\frac{1}{2}$ oz.

Flavazine $\frac{1}{2}$ oz.

Water 10 ozs.

Instead, however, of coloring the film itself, a black and white positive film can be projected from a cinematograph apparatus fitted with a revolving tinted screen, approximately one-half of which is colored orange-pink and the other portion blue-green, so that the pictures are projected through the colors.

It is to be understood that the revolving disc, provided with a slit and colored, may be used in place of the usual shutter, the portion of the disc between the slit and the coloring being blackened or otherwise rendered opaque.—*British Journal of Photography*.

To Preserve Photographs

A well-cleaned piece of plate glass is thinly covered with the following solution of resin:

Canada or Peru balsam.... 100 grams

Ricinus oil 3-5 ccm.

The photograph is squeegeed face down on the glass, so that no air bubbles remain. In this way the picture is protected from the effects of the atmosphere.—*Photographische Chronik*.

Increased Sensibility by Application of Dyestuffs

The *Photographische Rundschau* notes some observations by Lüppo-Cramer concerning the increase of sensibility to white light when silver bromide emulsions are impregnated with the usual dyestuffs. Based upon the known increase of sensibility of silver iodide, as detailed in a recent issue of *Photo. Industrie*, Lüppo-Cramer inferred that the total sensibility of the bromide might be similarly increased; that is, the emulsion given not only a wider range of sensitiveness, but a greater degree for all parts of the spectrum. He found a noticeable increase in the sensitiveness of grainless bromide, under admixture with all known sensitizers. Pinachrome solution (1 to 20,000) was stronger in its action than a 2 per cent. solution of sodium nitrite. The opinion is expressed that the action is chemical, in the sense in which H. W. Vogel used the term, although the action may involve an absorption, but such explanations are little more than words in our present ignorance of the intimate nature of the photographic image. Even silver chloride takes on increased sensitiveness when treated with some of these dyes.

The author expresses the hope that by these means a highly sensitive *fine-grained* emulsion may be obtained which will be very useful for many photographic purposes.

Matt Surface Printing-Out Paper

There are many kinds of matt surface paper for photographic use, each possessing qualities of its own. The image printed thereon may remain in monochrome or colored to taste.

Papers prepared according to the following formulæ will answer a double purpose. The print may remain as produced, or it can be used for coloring. The colors take well to this class of paper. Photographic paper prepared with phosphate of silver was first made by Doctor Fyfe in 1839. It appears that Doctor Fyfe and others experienced considerable variability in the results.

A combination of phosphate of soda with chlorides, the writer found several years since, produced a very good matt printing-out paper, so for the benefit of others who wish to prepare their own paper, which may be here stated is not at all a difficult matter, the formula is given. There need be no difficulty experienced in obtaining paper suited for the work. There is a very fine quality of paper made by the Whiting Paper Company

called Angora White, in sheets 21x33. This paper is remarkably free from metal spots, and answers the purpose well. There are other kinds which can be obtained from photographic dealers as a plain paper and also from artists' colormen. The Angora paper can be obtained in two different weights. Whatman's hot-pressed drawing papers can also be used, and as these papers do not have to be coated with a sizing some trouble will be saved, because there is enough sizing in the salt mixture.

The mixture can be used at a temperature of 60 degrees Fahr. Any size sheet of paper can be used; 11x14 is a very good size. A 14x17 tray is a very suitable size for holding the salting solution.

FORMULA NO. 1.

Phosphate of soda	50 gr.
Chloride of ammonium.....	100 gr.
Chloride of sodium.....	100 gr.
Distilled water	20 oz.
Gelatine	120 gr.

The salts must be allowed to dissolve first, then add the gelatine. After half an hour's soaking, the mixture may be heated and well stirred, and, when nearly cold, strained through a folded piece of cheesecloth that has been well washed in clean, hot water beforehand.

FORMULA NO. 2.

This is not a phosphate paper, but as it produces a paper with an excellent surface the formula is given:

Distilled water	20 oz.
Chloride of sodium	130 gr.
Chloride of ammonium	130 gr.
Gelatine	120 gr.

This salting mixture can be made up and used in the same way as formula No. 1. The sensitizing solution is the same for each and is made up as follows:

SENSITIZING SOLUTION.

Distilled water	22 oz.
Nitrate of silver C. P.....	3 oz.
Citric acid (crystals)	¾ oz.

The paper is prepared with the salting liquid by simply floating it upon the calendered face for 2 minutes, then drying it by suspending in a warm room free from dust. A number of sheets may be prepared, marking the back of the sheet by some distinguishing mark, so that the surface may be known when the paper is sensitized.

The sensitizing of the paper is accomplished by placing the salted face of the sheet down upon the nitrate of silver solution above mentioned by simply bending the sheet

like the letter U, allowing the middle of the bend to touch the liquid, then lowering each end down upon the liquid. Should the ends curl up, they may be flattened by breathing with the open mouth a slow damp breath upon the back of the paper. It will then lie down flat. If the paper is thick it may prove a little obstinate. Then by laying a wood photographic clip upon the upturned part it will soon compel the sheet to flatten out. The sheet of paper must be lifted from one end to ascertain whether any air bubbles exist upon the surface or not. If they do, they must be dispersed by touching them with the tip of a glass rod dipped into the silver solution, and then lowered down upon the liquid.

The sheet of paper must be allowed to remain upon this solution for 3 minutes, then lifted and suspended cornerwise to drain over a funnel, thus saving the silver solution that would otherwise drop upon the floor. The sheet must then be suspended by wood clips to dry away from active light.

The printing of the picture is carried out in just the same way as for any other printing-out paper, carrying the printing a little deeper than is required for the finished print.

When the printing is complete, the prints may be toned in an ordinary borax gold toning bath, consisting of:

Water	32 oz.
Chloride of gold	3 gr.
Saturated solution of borax....	2 oz.

As soon as the right color is secured to suit one's taste they must be placed into cold water, changing the water twice, then fixed in a solution of hyposulphite of soda measuring 18 on the hydrometer. About 10 minutes will be required, during which time the prints must be turned over and over to make sure that each print is brought into contact with the hypo. This is to insure complete fixation, after which the prints must be well washed for half an hour in either running water or by changing them from tray to tray of clean water, they may then be dried and trimmed for mounting.

Explosion of Flash Powders.—An accident that recently happened in Paris, by which the proprietor of a photographic establishment was seriously injured, leads *La Revue Française* to point out that, while these powders are safe when used in small amount and according to the directions given by the makers, they are nevertheless to be considered as explosive, and the main stock should be carefully guarded.

Notes from Foreign Sources

From *La Revue Française de Photographie*

CLEANING THE HANDS. Under the title "Useful Advice," several methods of removing stains caused by photographic solutions are described. These stains are mostly from the developers, colors and oily inks; also sometimes silver stains. Developer stains are removed by Labarraque's solution, which is prepared from bleaching powder, but it is apt to irritate the skin, and the odor, which is disagreeable, is rather persistent. Potassium permanganate is satisfactory. The solution is made by dissolving a few crystals in water. Washing the hands in this solution, using a brush to clean under the nails, the skin will acquire a uniform brown tint, but this can be removed by rinsing with a small amount of concentrated solution of sodium bisulphite, followed by tap-water.

Silver stains are removed by the permanganate solution mixed with a small amount of sulphuric acid. Any brown stain that remains after this treatment may be removed by the bisulphite as noted above. These methods are also applicable to removing stains on white tissues, but color tissues are apt to be bleached by the chemicals. Greasy inks are liable to become attached to the hands in using the bromoil and other similar processes, and are removed as follows: The hands are first well soaped, so as to make a good suds, then a small amount of gasoline is added, and the hands rubbed together so as to distribute this throughout the mass. The ink is thus converted into an emulsion and can be easily washed out with free use of water. Any stains that may remain should be subjected to a second treatment.

SKIN IRRITATION BY A DESENSITIZING SOLUTION. It has been found that the concentrated solution of aurantia in acetone, which A. and L. Lumière and Seyewitz have recently recommended as a desensitizer, has a very marked irritant action of the skin, sometimes producing serious inflammation. It has, therefore, been put on the market in alcoholic solution much less concentrated than the original acetone solution, but it will be well to use caution even with this newer form.

EDUCATIONAL MOVING PICTURES. A company has been formed at Naples that proposes to publish under the auspices of prominent scientists, artists and literary authorities, films in which the dramatic interest will be used as a pretext for the introduction of educational matter. It publishes a

review under the title "La Conquista Cinematografica," of which the first number has just appeared.

THE "MOVIE" AT SEA. Daily exhibitions of moving pictures are given on board one of the steamships of the Canadian Pacific line.

From *Bull. Soc. Française d. Phot.*

THE WORK OF LOUIS LUMIERE. Louis Lumière has been elected a member of the Institute, and a comprehensive account of his scientific work is given by E. Wallon. One of the first communications published by him was in 1887, concerning two mineral developers, ammoniacal copper chloride and hydrosulphurous acid, but secondary reactions render both of them practically useless. In 1904, he showed, in association with Seyewitz, the character of hydrosulphites, derived from organic bases that had themselves developing properties. The number of mineral substances capable of developing ordinary plates is limited. Certain ferrous salts, especially the oxalate, have been long used. Cuprous chloride will develop, but the product of the action destroys the image.

FUNERAL OF LIPPMANN. The funeral services for J. F. Gabriel Lippmann were held in Paris on July 18. D. Berthelot represented the Institute, Hamy the Bureau of Longitude, and P. Appell the Council of the University. Mollard, Dean of the Science Faculty; P. Berard, Minister of Public Instruction, and members of the Society of Photography were also present.

A Curious Phenomenon.—Dr. Reicher writes to *Lux* an account of an experience that is peculiar. In cleaning a lot of old negatives, he found one that showed a distinct though feeble positive impression on the glass. The effect could not have been due to any of the gelatin film remaining, as treating the plate with strong nitric acid did not change the impression. The impression was too feeble to permit of making a paper print from it. He has not found any account of such a phenomenon in photographic literature, and can give no explanation of it. Faint impressions of the negative were noted every now and then in the days of wet plate work when glass was used several times. This fact was often applied in making the so-called "spirit" pictures. That such effects are now-a-days rarely noted is probably due to the fact that few photographers use a plate a second time.

Davis Pictures at The Camera Club

Charles H. Davis, formerly associated with Rudolf Eickemeyer, Jr., and located on Fifth Avenue, New York, gave a one-man show during the month of October, 1921, at The Camera Club, New York. There were nearly one hundred prints displayed, consisting, to a great extent, of portraiture, with figure studies, nudes, some foreign street scenes and a few landscapes.

Mr. Davis, from years of experience, is an unusually fine technician, and this was reflected in all of his work. Few excel him in posing his sitters; his characterizations left little to desire but much to admire.

His "Otis Skinner" in character rendered this stage celebrity and popular idol faultlessly in one of his favorite poses, his facial expression, and all his familiar peculiarities of manner. Here, too, one was attracted by the wonderful technique.

A large (24 x 36) draped nude figure of great beauty was of outstanding merit, exceptional quality, textural finesse and charm.

A number of dancing female portrayals, varied in action, rhythmic in movement, all full of grace, were most interesting and admirable, and these lent variety to the exhibit.

Portraits, as might have been expected, contributed the chief attraction, and all these—indoor and outdoor renderings—were arranged with exquisite taste, and made into real pictures which must have pleased the sitters, for they delighted the audiences that saw them. Mr. Davis appeared equally clever in his portraits of men as in those of women, although the latter were, in most cases, especially good.

A print that deservedly attracted much attention was "The Powder Puff," which presented a beautiful girl figure without vulgarity, but with reticent refinement.

A charming morceau was "A Wet Christmas—Plaza San Marco." It depicted a rainy day, with splendid gradations, nuances and great atmospheric charm.

Many prints were extraordinary in sunlight effects, notably "Sun Glory," "The Old Garden," "The Dancing Class," "The Flower Basket," "The Inquisition," "Roman Peasants," "The Greeting" and "The Wall Flower."

"Favorita" was an example of a Turkish dancer, whose graceful lines, gyrations and expression, with the accessories, was a picture full of enjoyment.

"Finis" offered a nonchalant damsel, endishabille, languidly reposeful, draining an

upturned glass—the last drop, finis—then entered prohibition!

In closing, I must not omit to speak the praises of "Elsa," "The Window Seat," "Nora," "Bacchante," "An American Beauty," "Miss Alice Joyce" and "A Studio Portrait" of the same, "Phoebe," "Miss Ina Claire," "An Old-Fashioned Girl" and "At the Mirror."

Among Mr. Davis' collection were several salon prints.—FLOYD VAIL, F.R.P.S.

The Production and Properties of Optical Glass. (*Herstellung und Eigenschaften des optischen Glases.*) By F. Weidert. Printed in Berlin, Germany, 1921. From the C. P. Goerz American Optical Company, New York.

This pamphlet, reprinted from a German engineering journal, gives a very interesting account of the present state of the manufacture of glass for precision instruments. Those who were concerned with the war industries know the serious problem that was before the nations that entered into war with Germany, on account of the lack of glass for the many instruments needed for research and actual warfare. For many years, Germany had been the main supplier of such glass, and the establishment of industries in other countries involved the necessity of studying both the theory and practice of the procedures for obtaining the glass in quantity. The pamphlet before us presents a statement of the earlier work in the way of getting glass entirely adapted for the construction of lenses, prisms and similar articles, and also gives extensive information of the methods employed in the great German factories. The author of the pamphlet is of the opinion that material improvement in the quality of optical glass is not to be expected. Presumably, he refers to the unlikelihood of glass being made with materially different optical properties than those now known. Predictions, however, as to what research cannot accomplish are rash, and we may still hope for new and epoch-making discoveries in this as in other fields.—H. L.

Frederick W. Keasbey, Morristown, N. J., announces that the Kalogen and Struss Pictorial Lens can be secured at 22 East 30th Street, New York City. A full line of SPLs will be in stock. At the new agency's office will be an exhibition of examples of the work done with this lens.

The Mutual Action of Adjacent Photographic Images.

A review of the work of Kostinsky, Lau, Turner, Bellamy and others on the attraction and repulsion of neighboring star images was given. The factors which control the action were shown to be:—(1) *Turbidity*, causing an attraction through optical reinforcement of the images on their adjacent sides. A formula was derived giving the amount of this attraction. (2) *Gelatin* disturbance, causing an attraction also. (3) *Developer* action, in which development of the images on their adjacent sides is retarded, owing to the products of reaction, as in the Eberhard effect. This leads to a repulsion. In the case of neighboring absorption spectral lines there is an additional effect due to difference in sharpness of the edges which is caused by turbidity and halation.

Experimental data on the behavior of artificial double stars, close bright lines, and close absorption lines were described. It was shown that in experiments of this nature important differences develop depending on whether the exposures are normal or overexposed. The contradictory results obtained by various investigators are thus explained. If the behavior is investigated by means of overexposure, strong repulsions of neighboring images are found except in the case of absorption lines in which a strong attraction is found. In the case of normal exposure, which is of most interest in general, an attraction is usually obtained amounting to two or three microns. In order to reduce the effect, which enters as an error of importance in measurements of this kind, *the exposure must be reduced to a minimum*. In the case of overexposures, considerable variation of the repulsive action was obtained by varying the developer. Curves for a number of developers were given in which it is shown that an attraction sets in, followed by a repulsion as the distance becomes less. It is important to make a further study of developers.—*Astrophys. J.*, June, 1921,

The one-man show at The Camera Club, New York, for the month of November, 1921, will consist of the work of Dr. Rupert S. Lovejoy, of Portland, Me.

The picture entitled "Brothers," which we printed on page 398 of the October issue should have been credited to Mr. H. B. Conyers, Urbana, Ohio, and not to Mr. F. V. O'Connor.

Paris Notes.

We are indebted to the *British Journal of Photography* for the publication of the accompanying notes from their Paris correspondent.

An Exhibition of New Inventions.

On August 26 there was opened in the Esplanade des Invalides the nineteenth annual exhibition of the Association of French Lesser Manufacturers and Inventors, a fixture which is better known under the name of Concours Lepine, in reference to the well-known prefect of police who gave much encouragement to this institution in its early days. Although originally intended for the exhibition of novel toys made by Parisian workmen, the exhibition has long included extremely varied articles and almost always some photographic novelties. Two new models of magnesium lamps are shown by M. F. Pechenot. A feature of both is a very effective automatic catch by which any premature operation of the lamp is prevented. One of the models is fitted with ignition by pyrophorous metal (ferro-cerium); the other by a species of touch-paper, which is employed as a continuous band. Both lamps are provided with a light handle, allowing of holding them at arm's length, and with bushes for attaching them to the photographic tripod.

M. Ch. Dupont has devised an indicator for the speed of movement of the film in the cinematograph projector, the pointer being controlled by a device very similar to the centrifugal regulator of a steam engine. Equipment for photography from a kite is shown by M. L. P. Frantzen, and consists of a strong though light camera, which can be attached to a suitable kite, or can be hoisted up to a kite which has already been raised to the required height and brought down again after exposure of the negative.

Another photographic exhibit is that of the Stampa Company, who for about two years past have been supplying a "citra" sensitiser for application to papers, fabrics, leather or wood. They have now just begun the manufacture of sensitive tissues, and show some fine results of printing on silk and canvas.

New Electric Lamps.

The Compagnie Générale des Lampes of Paris has recently worked out, at the request of several physical laboratories, a tungsten filament lamp of cylindrical form,

filled with nitrogen and having the filament constantly stretched in the axis of the cylindrical bulb by means of a spring. The intensity is much greater than that of the filament of a Nernst lamp, and these lamps are of great advantage when it is wished to obtain pencils of light of equal intensity in different directions, as, for example, in many photometric instruments used for the measurement of negatives. The lamps likewise serve for the illumination of the slits of spectrographs, and in some cases may even be used in place of a slit.

For the purpose of increasing the efficiency of the incandescent electric bulbs used for projection, a Parisian maker of projection apparatus, M. E. Mazo, has adopted with great success the plan of silvering the whole surface of the bulb with the exception of a small patch immediately facing the condenser. In consequence of the internal reflection the filament reaches a higher temperature, and, moreover, the light is projected forward in such greater measure that the efficiency of the lamp is increased by more than 50 per cent.

Studies of Ultra-Violet Light.

In the course of experiment on the influence of ozone on the absorption of solar ultra-violet rays by the atmosphere, MM. Ch. Fabry and H. Buisson have undertaken some sensitometric measurements with ultra-violet light, and have obtained some interesting results. In the case of the particular plates employed (Jougla Mauve Label), and within the spectral region studied, viz., 3,150 to 2,900 AU, the development factor or gamma has a constant value, less than half the value obtained under the same conditions of development, for the visible (blue-violet) part of the spectrum. It was also found that the gamma values were slightly different for the above region of the ultra-violet when successive exposures were made at variable intensities for a constant time, and then at a constant intensity for a variable time. The variation of photographic activity in the particular region of the solar spectrum is great; the sensitiveness at 2,975 AU being about 6,000 times greater than at 2,936 AU. Moreover, the measurements of the opacities of photographic films uniformly exposed and developed, show that the opacity is highly variable within this part of the spectrum. A film of opacity 500 in the visible violet has an opacity of only 30 at 3,130 AU, this opacity rising

to 400 at about 2,500 AU. The opacity is practically constant in the same part of the spectrum after intensification with mercuric chloride and ammonia, whereby the silver image is almost completely replaced by mercurous amidochloride.

Some Recent Patents.

The recent publication of a French patent of L. Dufay (No. 520,784 of November 30, 1917) throws some light on the mystery which has surrounded the operations of the Versicolor Company, which is the concessionaire of this patent. For the production of photographs in natural colors on paper there is employed, for taking the negative, a transparent mosaic screen in three or four colors of regular geometric pattern and having its units of sufficiently intense colors for making the customary selection. A screen of the same geometric pattern is impressed upon paper but with much weaker colors, this positive screen impression being covered by a sensitive emulsion for positive printing. After development and drying of the negative obtained by exposure of a panchromatic plate through the negative screen, the negative so obtained is laid in register on the screen-coated positive paper, register being judged by the appearance, by transmitted light, of colors complementary to those of the subject. The positive print is then exposed, and, when finished, reproduces, so it is claimed, the colors of the subject.

In France, as is well known, the granting of a patent is made without any examination of the practicability or novelty of the invention. All that is necessary is that the application and any illustrated drawings shall be made on paper of a certain size. Profiting by this state of things, an "inventor" has transcribed almost verbatim (Patent No. 522,919, of March 12, 1919, granted to M. de Gaudart d'Allaines) an article by Captain A. Calvet, published in 1911 in the "Bulletin of the French Photographic Society" (Series 3, Vol. II, pp. 329-244), on development by means of two dishes. The author of this new patent has confined himself to modifying the formulæ, but the alteration appears to be somewhat ill-judged, for the use of sodium chloride is directed as a restrainer of diamidophenol developer, apparently without recognition of the fact that this salt will then be added to that already formed in the bath by the action of the diamidophenol hydrochloride on the soda sulphite.—L. P. CLERC,

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THE PHOTOGRAPHY OF ARCHITECTURE
—WILLIAM S. DAVIS

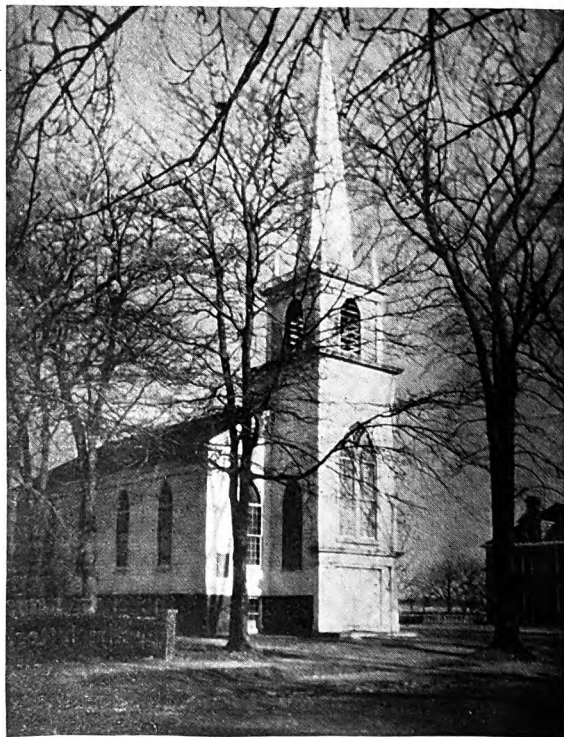
THE field of architectural photography is a broad and interesting one, whether considered from the commercial standpoint of the professional or the pictorial aspect which appeals to many advanced amateurs. It is not my purpose to go into the first mentioned phase of the subject, though in passing I may mention some of the opportunities open to one who understands the requirements of possible clients. These include series showing clearly progressive stages in the construction of an important piece of work; interiors, covering not only the general architectural effect but the different kinds of material employed; pictorial impressions of the structure and notable details under striking conditions of light and shadow or other "effects"; views around country estates, and historic buildings of local or national interest shown from an unhackneyed viewpoint or under especially effective conditions of atmosphere. Architects, contractors, firms supplying various materials and interior fittings, owners, tenants, magazines devoted wholly or in part to architecture and home making, and, in certain cases, the general public, all use such photographs when their own particular needs are complied with.

Whether the work be done in the line of business, or for pleasure only, a knowledge of technical procedure is required, together with sufficient appreciation of different classes of architecture and the effects produced by changes in angle of lighting and quality of atmosphere, if the characteristic qualities of each subject is to be successfully rendered, whether the latter is an effect of height and massiveness, or the quiet simplicity of a little cottage.

The first consideration is, naturally, that of finding the viewpoint which will show the required features most pleasingly. Quite frequently the choice of a standpoint is somewhat limited by the proximity to the subject of other

buildings or objects which it is undesirable to show, but when not so hampered, one should pay special regard to the lines of perspective. Very abrupt convergence of lines, which occur when too near a point of sight is selected, gives an unpleasant effect, making the nearest portion appear disproportionately large, while an extremely distant viewpoint flattens the perspective. The latter is usually a noticeable feature of architectural views made with a tele-photo lens—the nearest and most remote portions of a building appearing to be upon practically one plane. A standpoint which shows the whole of a structure, without crowding the image when using a medium angle lens (say one whose focal length is approximately equal to the diagonal of the negative), usually gives satisfactory results in this regard, an example being given in our illustration "The White Spire."

A low point of sight helps to emphasize the feeling of height and importance in the subject, owing to the horizontal lines in the upper parts of the building slanting downward (when viewed in perspective) while those near the foundation remain practically level. A high viewpoint produces, as a rule, the opposite effect and even when the actual size is fairly well indicated by some detail which furnishes a scale for comparison results in some loss of dignity and impressiveness. Of course there are times when the desire to introduce certain accessories.



"THE WHITE SPIRE"

WILLIAM S. DAVIS



"IN THE BURE VALLEY"

BERTRAM COX, F.R.P.S.



BELLE JOHNSON

or secure an unconventional rendering, will outweigh other considerations, for in many cases it is quite necessary to include something of the grounds, or foliage effects comprising the setting, in order to convey an adequate impression of the whole. This brings us to another matter, which is the changes produced at different seasons of the year when trees and grass are included in the composition.

Rich summer foliage can sometimes be utilized very effectively to frame a vista showing the building beyond, or the delicate leafage of early spring might form a partial screen, but when foliage of any kind obscures the structure too much, it should be taken while the trees are bare. To secure the illustration previously mentioned from the standpoint chosen, it was necessary to work when foliage was absent, but notwithstanding this, the trees, with their network of branches, contribute materially to the pictorial effect, but without interfering with the details of the structure.

A direct front view is the worst which can be chosen unless one wishes to duplicate the lines of an architect's "front elevation" drawing. Even where only the front is visible (as one of a block of buildings) the result can be improved by selecting a point of sight a little off center and when one side as well as the



"MISSION SAN JUAN CAPISTRANO"

SHAW STUDIO

front may be secured in a picture there is a chance to vary the effect considerably by lateral movement of the camera. Try, however, to avoid a point of sight at an exact angle of forty-five degrees, especially when the subject is a square, block like structure, as this causes a repetition of each line in perspective besides giving equal prominence to front and side.

The direction and strength of light plays an important part in the general effect and to bring out the character of the subject properly judgment must be exercised in selecting the working conditions. The impression of solidity, or depth in the third dimension, is conveyed most strongly when one side of a rectangular object is in shadow while the side at right angles to the first is well lighted. Since shadows subdue while light gives emphasis, the portion in full light should be the most important section, providing the location of the structure relative to the points of the compass allow such a choice being made. In rendering projecting details, such as sculptured ornaments or columns of a portico, the best effect of relief is seen when the light strikes obliquely across the surface to be photographed from such a direction that the cast shadows fall toward the observer.

While the low angle of illumination occurring in early morning or mid-



"OAKLAND TECHNICAL HIGH SCHOOL"

SHAW STUDIO

afternoon usually gives a good effect, there are occasions when a nearly vertical lighting produces the most effective shadows, this being true when it is necessary to emphasize such horizontal projections as mouldings and cornices, which will cast the greatest amount of shadow downward near noonday.

As contrasts vary with the intensity of the illumination, the most natural method of keeping the scale of tones within workable limits, when dealing with a structure exhibiting highly projecting or deeply recessed parts—both of which introduce the greatest contrasts of light and shade—is to work on a day when the sunshine is diffused by haze or white clouds over the sun. The former cuts down the intensity without wholly destroying cast shadows and at the same time has a tendency to make deeply recessed part more luminous, owing to the refraction of light from the semi-opaque drops of moisture in the atmosphere. A subject composed of nearly flat surfaces, with no detail in high relief to break the monotony, needs stronger lighting and as much cast shadow as possible to render it attractive.

The pictorialist often prefers to emphasize tone-masses rather than detail. Such treatment has been successfully adopted when dealing with buildings, which present a beautiful silhouette against the sky, or large sections forming interestingly arranged spots of varied tone capable of being worked into a well balanced design, or "pattern," in the picture. A church spire, for example, is sometimes effectively rendered "en masse" against a striking cloud-effect or sunset glow. When such treatment is too heavy, as might be the case with a tall structure of bulky proportions, the feeling of height and mass can be suggested in a lighter key by showing the building looming up through fog or during a snow-storm. Owing to the varied details of construction, the treatment of each subject becomes something of an individual problem.

Often a part can be shown to greater advantage than the whole and may be used even when one wishes to indicate the general character of a structure. From the pictorial viewpoint, a comparatively small bit very often possesses greater possibilities for artistic handling than more would.

As to the photographic equipment and details of technique. There is no doubt but what the most convenient instrument to manipulate in this class of work is a fair sized back-focusing view-camera, since it possesses every needed adjustment and the working parts are most easily used. Most folding plate cameras, however, have a rising-front and swing-back—the two most essential features—and it is possible to do good work within limitations with a pocket camera, though the objection to the latter lies in the fact that having no means of correcting the distortion resulting from tilting the lens upward when photographing a tall building, most of the negatives show convergence of vertical lines toward the top. Even this may be corrected when printing, but at the cost of some inconvenience, by using an enlarging-lantern and tilting either the negative or easel until such lines show true. Such a roundabout method is not recommended, however, when better means are available, so for all careful work it is assumed that a camera with proper movements is used upon a tripod.

In choosing lenses, the single achromatic is commonly ruled out, owing to



its rendering of straight lines as slightly bent when they appear near the margin of the image. This defect is practically unnoticeable, though, if the image of a building can be kept well within the boundaries of the picture, or a very long-focus lens is used, such as is needed to obtain a large image from a distant viewpoint, this being due to the fact that rectilinear distortion increases with the view-angle included by such a lens, and is very slight when only the central, nearly parallel, rays are utilized. By observing these points the writer has at times used single lenses without experiencing difficulty, but for all around utility, a doublet of the rapid rectilinear or anastigmat type should certainly be selected, the latter possessing advantages for technical workers who require absolutely perfect marginal definition over a wide field. Probably the most useful focal length for general utility is about the diagonal of the plate, i. e., approximately 6 inches for 4 x 5, 8½ for 5 x 7, etc. If a convertible type is selected, the single elements can be used when a long-focus lens is needed, thus saving additional expense, though if much work is done, it might be better to have a separate lens of about fifty per cent longer focus than the one first mentioned, but for this it would not be necessary to go to the expense of an anastigmat, since a rapid rectilinear will give very fine definition over a moderate field at a fraction of the cost. The professional worker will also require a wide-angle lens for subjects in such cramped locations as to preclude the use of any other, but such a lens should never be used when one of longer relative focus will serve the purpose. The focal length of the wide-angle lens should be about equal to the narrowest dimension of the negative. The amateur can usually get along very well by adding a supplementary lens to his outfit, either one sold as "wide-angle" or the familiar "portrait attachment" answering the purpose when the regular lens they are used with is well stopped down.

The seeker after artistic quality might find it interesting to try the effect of using a "pin hole" in place of a lens. While the definition is not biting sharp, it is by no means so blurred as many suppose, giving, in fact, a delicate softness without loss of essential detail and aside from the question of definition, it possesses the unique advantage that one can regulate the amount of subject-matter included from a given standpoint, from the widest angle to the narrowest, by adjusting the separation between focusing-screen and camera-front. On account of possessing practically universal focus, the swing-back can be freely used without giving a thought to equalizing the definition by careful adjustment of focus and size of stop, as must be done when a lens is used.

Orthochromatic plates or cut-films will usually give very satisfactory results, especially with a suitable filter, but a panchromatic emulsion possesses undoubted advantages in rendering more truthfully such tints as those seen in red roofs and brick-work at close range.

Ray filters are valuable accessories; a four times yellow filter being most useful in maintaining relative tonal gradations in such subjects as a white building against a blue sky. When color contrasts are excessive, as, for example, white in sunshine together with red and brown tints or deep green foliage, a filter will prove helpful in combination with a non-halation color-sensitive plate;



"WATCH OUT"

CLARENCE STEARNS

an eight times filter being better than the lighter one in such cases. The benefit of a ray-filter for this purpose is only brought out, however, by giving a very full exposure for the shadows, letting the filter take care of the high-lights, which will prevent any tendency to force development of the negative.

In manipulating the camera, try to find a satisfactory viewpoint at a reasonable distance to prevent violent perspective in the subject; level the camera on the tripod, and, after deciding how much of the upper portion of the scene should be shown in the photograph, bring as much as possible of this into the field of view by using the rising-front of the camera. If this alone is not sufficient, the camera will have to be tilted until the desired amount of matter appears upon the focusing-screen, after which it will be necessary to employ the swing movement to bring the back into a vertical position again, since the convergence of vertical lines sometimes seen in photographs comes from the sensitive film not being in a parallel plane with that of the subject at the time of exposing. As movement of the swing-back throws the plane of the focusing-screen off the axis of the lens, re-focusing is necessary to secure proper definition. This is best done by obtaining a sharp focus across the center of the screen, afterward reducing gradually the size of the lens-aperture until the definition appears equally good at top and bottom margins.

When reds or blues are present in important amount, use a ray-filter, and in all cases time the exposure in proportion to the degree of contrast present. Expose for the shadows is an old rule and in no branch of the work is it more important to good technique than in architectural photography, for when the deep shadows have received ample exposure, the detail in these parts will appear during development of the negative before the high-lights are overdone, which is not true of an under-timed negative.

Given the proper exposure, it makes but little, if any, difference what developing formula is employed, any of those used for the normal run of work being equally satisfactory. It is an advantage, however, when the subject possesses great contrast to use a rather dilute solution, as this promotes the appearance of detail throughout before printable density is built up.

SUBMARINE PHOTOGRAPHY

THE sky and the ocean have been from the dawn of written history objects of curiosity and awe by all mortals. We cannot in these days appreciate the effect that the stretch of the great oceans must have had upon the peoples living on their shores, nor do full justice to the courage of the navigators who braved the risks of sailing on these to them trackless wastes, the peril greatly increased by the superstitions that had been developed.

The heavens and the deeps are yielding their secrets, and photography is contributing actively to this work. It has been of immense use in astronomy, and of late years the difficulties of moderately deep sea work have been overcome. Ernest Coustet, in a recent issue of *La Revue Française de Photographie*,

devotes considerable space to the history and present state of submarine photography. Being a Frenchman, he is not familiar with the Shakespearean allusions, or he might have given a poetic turn to his narrative. Clarence, for instance, in describing his dream of drowning, tells of the

"Wedges of gold, great anchors, heaps of pearl,"
which he saw on the sea-bottom, and Ariel, in his song, tells how

"Full fathom five thy father lies,
Of his bones are coral made;
Those are pearls that were his eyes,
Nothing of him that doth fade, but suffers a sea change."

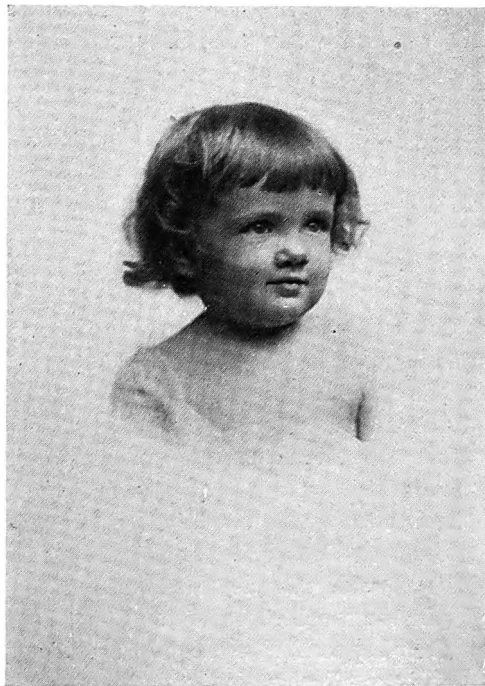
However, these pictures are but products of a vivid imagination. The modern world wants ascertained data. Coustet tells us that the first attempt at submarine photography was by the inventor of a diving boat, William Bauer, a protégé of the Grand Duke Constantine. In 1856, Bauer experimented in the port of Cronstadt with a boat, which he called "Sea-Devil." He studied several of the features of under-water phenomena, and had a camera located behind an opening, by which he took a few views of rocks and submarine plants, illuminated by a lamp.

As might be expected, the pictures were not very satisfactory, the only process then known for negatives being the wet collodion method, which was slow. Satisfactory pictures of living objects are obtainable only with high-speed plates. Bauer's experiment was not followed up for a long while. In 1886, Boutan obtained some submarine views by means of a **water-tight camera** submerged and manipulated by a diver or from a boat, but the first results were also unsatisfactory. It was also found that in some cases very long exposures were necessary, but Boutan persevered, and was finally successful in getting instantaneous pictures. His success was in large part due to increasing the illumination, first employing magnesium ribbon burning in a current of oxygen, and afterwards a pair of arc-lamps placed on either side of the camera. In 1898, he obtained excellent pictures about the size of the old-fashioned half-plate; in some cases, the details were so sharp that the scales on the fishes could be counted. The Optical Society of Paris defrayed the expenses of the later experiments, and the results were shown by lantern slides at the Paris Exposition of 1900. Shortly after the date of Boutan's experiments, Etienne Peau obtained good results with a very simple and comparatively inexpensive apparatus. A sheet-metal cylinder was provided at one end with a transparent disc, 11 centimeters (4.4 in.) in diameter. In front of this window, a conical shield of thin metal was placed to cut off sidelights which had been found to cause veiling in this work. The manipulation of the plates was by means of appropriate mechanism, the shutter being operated in some cases pneumatically, in others by an electro-magnet. The submerged part of the apparatus had two boxes containing solid calcium chloride to absorb the vapor of water, especially that which is apt to be set free from the air in the form of mist when the apparatus is submerged in cold water. If this condition is not prevented a deposit will form on the window-glass and lenses.

All the forms of apparatus employed up to that time had the disadvantage of permitting only shallow submersion, and, further, many of the views were merely by chance, so that striking pictures were obtained only at rare intervals. In 1911, an English naturalist, Francis Ward, built on his estate at Ipswich, alongside of a creek a subterranean studio, with a glass window looking out into the waters of the creek. He could in this manner observe the movements of all aquatic life, while entirely unobserved, as the chamber was in perfect darkness. He was able to photograph not only wholly aquatic creatures, but also amphibians, studying especially the methods used by diving birds for catching their food. He constructed a grill to confine the animals within a suitable area.

Even these methods have a disadvantage in that the creatures are in a somewhat artificial environment, being restrained, and it is desirable to secure results from absolutely natural conditions. As Coustet says, the photographer wants to go to the client and not wait for the client to come. Moreover, the views obtained by the older methods showed only one moment of the action of the animal, and modern taste requires a reproduction of the motion.

The most satisfactory results have been obtained by the Williamson camera, the results of which are familiar over the world by their incorporation into movie shows. An extensible tube is provided at the end, with a chamber large enough to contain the operator and the camera, and in this way the film



"STUDY"

BELLE JOHNSON

may be taken at considerable depths. A cone of protection from side light is employed, as in Peau's camera. Cooper-Hewitt tubes are used for illumination. The apparatus was early used for the production of posed films, but was soon applied to registering natural scenes.

In this connection, Coustet, too, refers to the glass-bottom boat which is familiar to tourists in many places. Such boats have been used for photographic work, with an objective of large aperture. Some specimens of this kind were shown in *La Nature* in 1913.

Finally, Coustet alludes to an American invention, the Dibos water glass, a tube of light sheet metal about two yards long, one of the ends being closed water-tight with a glass plate. Plunging this tube into water it is possible to observe the conditions at a moderate depth, and by fitting a camera into the upper end a means of photographing is obtained.

The pictures so far made are in monotone, but there is little doubt that inventive genius will give us in time highly sensitive color slides, with which the remarkably brilliant colors of the animals and plants of the sea will be obtained in all their verisimilitude.

PRINCIPLE AND OBJECT OF ULTRA-RAPID MOTION PICTURE CAMERAS—A. PALME

THE mystery, which surrounded the production of motion pictures in the early days of the art, has been gradually lifted, and almost everybody knows today that there is really no such a thing as a moving picture, but that the whole process is only a clever deception of our sense of vision, and that the long strip of film is nothing else but a great number of small, individual photographic snapshots, resolving a given motion into a series of consecutive pictures, each one arresting a phase of this motion. If such a series of snapshots is projected upon a screen in quick succession, the human eyes are unable to comprehend each individual picture, but combine them, or, if possible to say so, melt them together, and the result is that the screen shows an apparent moving picture.

Experiments, made many years ago, proved that in order to obtain a smooth, apparent motion, it is necessary to project at least twelve pictures upon the screen every second. Later, a standard speed of 1000 pictures per minute, or about sixteen per second, was established all over the world. If a motion picture man takes a certain scene at this speed, and, upon finishing the negative and positive film, the lantern man projects the same scene at this speed, the result will be that the image on the screen will move before our eyes exactly as fast as the original did. The truthfulness of the projected picture, as far as its speed is concerned, will, therefore, depend upon how closely the lantern man can maintain the speed of the camera man.

Let us consider what happens if these two speeds differ. Suppose the camera man takes some very slow motion, as, for example, the growth of a plant, at a rate of only ten (10) pictures every hour, over a period of, say, one



week. This has been actually done many a time, and is not as tedious as it may sound, because it can be done by an absolutely automatic apparatus, working without any human help. At the end of the week we will have exposed seven times twenty-four times ten, or 1680 pictures, which will require a film of about 100 feet in length. If we develop this negative film, make a positive from it, and run it through a standard motion-picture projector, which throws upon the screen sixteen images per second, the whole job, which took one full week, will pass before our eyes in 1680:16 seconds, or less than two minutes. But, and here comes the great usefulness of this method, we can follow the growth of the plant in a very comprehensive way, in a way impossible to direct vision.

It will be seen from the above example that if the camera man takes his pictures slower than the lantern man projects them, the original motion is accelerated.

Let us examine the opposite procedure. Suppose the camera man takes 125 pictures per second for a period of fifteen seconds of, for example, a man jumping a hurdle. This will give him a total of 125 times 15, or 1875 pictures, or about 140 feet of film. If we reproduce this film at the standard rate of sixteen per second, it will take 1875:16 seconds, or about two minutes. Having the motion of the hurdle jumper, which takes in reality only a very few seconds, stretched out over two minutes, will be very instructive. Two minutes is a comparatively long time, and we will be able to study the motion of the jumper in all its details. A careful observer will be able to study, for example, the exact play of the muscles of the athlete. We see, therefore, that if the camera man takes pictures faster than the lantern man projects them, the original motion will be slowed down.

This is important, and frequently misrepresented, so let me repeat: If we see a picture which shows higher than normal speed, it was taken with a slow camera. If we see a picture with slower than normal speed, it was taken with a rapid camera.

It is obvious that no special equipment is necessary to take less pictures than the standard sixteen per second. The camera mechanism is simply operated at a slower speed, or, if the exposures are only a few each hour, they can be made with the lens cap, shifting the film after each exposure. This, as said before, can be done mechanically.

Far more difficult is the increase of speed beyond sixteen per second. One must remember that after each exposure has been made, the film has to be moved forward about $\frac{3}{4}$ of an inch, so as to get the next exposure upon a fresh piece of film. This pulling and stopping, pulling and stopping, etc., at a rate of sixteen times per second, or if it sounds better to you, 1000 times every minute, requires already quite some hustling of the mechanism, sounding to the ear like a lively purr.

In order to maintain a positive register of the individual pictures upon the screen, the motion of the film must be very accurate. A rather complicated cam mechanism, called Geneva cross, in conjunction with perforations on the

two sides of the film and sprocket wheels, takes care of this. Any reliable make motion picture camera will stand, with a little precaution, a 50 per cent. increased speed, or will permit, in other words, of taking twenty-four instead of sixteen pictures per second. By a skillful reconstruction of the operating mechanism of such a camera, it is possible to reach a speed of about fifty-five exposures per second, or 350 per cent. above standard. That would mean that we could stretch a one-minute performance to a duration of three and one-half minutes, which might be enough to study, for example, the slow walk of a man. Resolving the film transportation apparatus into two halves, that is, having two sets of claws, grabbing the film alternatively, an eight times faster camera can be built, giving 128 exposures per second, or 7680 per minute. This construction originated in America, and pictures taken with this camera were given wide publicity by Pathé Frères in Paris. Galloping horses, tennis players, jumping dogs and kangaroos, and similar pictures, permitting of a close study of the particular motion, were shown in all parts of the world. In recent years this eight-times rapid camera is being used very frequently for recording and studying athletic motions, and for technical purposes. It is especially for the latter that great benefits have been derived from this method.

Many motions on machinery of all kinds occur so fast that the human eye cannot possibly follow them. The ordinary standard motion-picture camera, with its one to one ratio of reproduction, cannot help out. The great variety of subjects, studied with best results with the aid of the fast camera, does not permit of being mentioned in detail in this short account. I will mention only a few remarkable cases:

1. Operation of springs on heavy auto trucks.
2. Operation of automatic electric circuit breakers and fuses.
3. Bursting of vessels under high pressure.
4. Operation of pump valves.
5. Destructive action of worn-out gears.
6. Time and sequence studies on fast automatic screw machines.

And many others.

Very recently a new impetus was given this subject by the invention of an entirely new rapid camera mechanism, permitting of an almost unbelievable speed. Mr. Jenkins, in Washington, D. C., the inventor of the first commercially useful motion picture machine, succeeded in improving a machine capable of taking seven hundred (700) or even more pictures per second, which is forty times faster than the standard speed. All previously built cameras took pictures upon an intermittently traveling film and a shutter. It is obvious that no mechanism could be made which would speed up and stop a film 700 times every second. Likewise no film would ever stand the terrific wear and tear resulting from such an almost inconceivably fast motion. This has, however, been very simply overcome by having the film travel at a constant speed, from the full reel, directly to the take-up reel. And instead of a mechanical shutter, a very ingenious optical shutter was introduced. Between the lens and the film is rotated a disc of glass which contains two, four or more circularly bent

prisms, so ground that one prism joins right to the next one. Light, passing through this quickly rotating ring-prism, will suffer rhythmical deviations from its straight travel, and will be thrown on and off the film in exact intervals. The manufacture of the circular ring-prism is somewhat difficult, but otherwise Mr. Jenkins' ultra-rapid motion-picture camera is far simpler than any other existing model, lacking any film transportation mechanism and shutter.

The writer was fortunate to see a forty-times Jenkins film reproduced in a standard projector of a girl skipping a rope. The resulting screen picture was so slow that it took very careful observation to detect any motion at all.

Such a camera is extremely valuable for disclosing motions which are so fast as not to be visible to the eye at all. For example:

1. Operation of an automatic pistol, including the ejection of the empty shell and reloading.
2. The flight of a bullet and the air eddies caused in its wake.
3. Condition of mashing of fast rotating gears.
4. Explosions of all kinds.

And many others.

It is obvious that a camera making 700 individual exposures every second will use up a large amount of film. The forty-times camera consumes over 3000 feet of film per minute. Assuming a price of five cents per foot of film, Mr. Jenkins' camera will require \$150 worth of film every minute! This is a large amount, spent in a very short time, but this sum is repaid many times by the improvements which result on the particular apparatus from this investigation.



"SPINNING THE TOP"

BELLE JOHNSON

CASEIN IN PHOTOGRAPHY

AN inquiry recently made by a correspondent as to the availability of casein as an alternative for albumen collodion for preparation of photographic printing papers recalls some experiments made by the writer in 1882 to employ casein as a substitute for gelatine in emulsion making.

Only partial results were secured, but proof was given that an image could be formed by an emulsion made with it; but the chief trouble at that time seemed to be in the impossibility of freeing the casein from traces of fat and that the body was much less desirable than gelatine for emulsion.

It was not until 1904 that further notice of its use was published. Dr. Buss took up the subject of the employment as a medium for printing out paper.

Although his results were not particularly satisfactory to himself, he remarks that it would be erroneous to disregard what has been already attained concerning its action and to maintain that the present media-albumen, gelatine, collodion, vegetable albumen, algæ, jellies, resins, starches, etc., fulfill all the requirements and adequately meet all the artistic demands of the photographer.

Any new substance should not be hastily dismissed because it does not readily yield to a few efforts to make it applicable, and so in the case of casein it might pay expenditure of further experimentation.

Among the numerous colloidal substances whose chemical and physical properties indicate the probability of their application as photographic media, a place in the front rank is occupied by casein.

Chemists, in their experiments, have remained unsuccessful, owing to the difficulty of overcoming the technical imperfection of casein laminae for photographic purposes to an extent that could make their advantage apparent.

Most of these experiments were undertaken with the object of dissolving casein in alkalis and utilizing this solution with silver chloride to coat paper. Under the erroneous idea that casein being an albumenoid would comport itself like albumen.

Pure casein, that is casein made by precipitation from skim milk by acetic acid and resolution in alkali and then reprecipitation by the acid, and not the commercial product, was dissolved in alkaline solution by aid of heat and glassy layers obtained upon paper coated with baryta. Flexibility was secured by addition of glycerine to the casein solution.

The dried papers were then sensitized by Dr. Buss in the usual way, both in neutral silvers and acid baths.

The chief fault in the papers is referred to the mechanical impediments. The films softened in the toning, and if this ordeal was escaped the hypo finished the job of destruction.

The use of alum or formaldehyde, however, improved matters considerably; but, on the whole, there was no marked advantage over albumen or collodion papers.

The technical difficulties seem, therefore, to be the chief cause of want of

success with casein. The papers prepared were fairly rapid and agreeable tones could be had. Some of the effects were pronounced by artists more agreeable than those had by the ordinary papers on the market.

Casein furnishes salts, both with metals and acids.

The alkaline caseates are easily soluble in water, although ordinary casein is practically insoluble therein.

The compounds with the metals are thrown down as insoluble precipitates (amorphous) from solutions of the alkaline salts.

Dibasicity is revealed by the fact that casein dissolves to an acid solution when stirred up with water and carefully treated with dissolved alkali; whilst, after neutrality is reached, it has the peculiarity that a further addition of the alkali can be made before the same appears in excess; that is to say, before the appearance of an alkaline reaction is noted.

The alkali caseate will therefore act as a di-basic salt in the presence of silver nitrate, normally with the formation of silver caseate, and this will invariably occur, no matter in what manner the casein and alkali are brought into solution.

The trouble is silver caseate is somewhat soluble in hypo; on the other hand, casein dissolves in very dilute acid from which solution it may be reprecipitated by neutralization with alkali without decomposition.

The same precipitate is obtained by use of certain metallic salts, and this would suggest its adaptability to photographic use in pellicles.

The subject deserves at least further investigation.

PHOTOGRAPHY A MEANS OF ART PRODUCTION

THE word "reproduction" is of frequent occurrence in connection with photography, when discussion is about its status in art; but to confine it to the status of mere reproductive art is to do it injustice, since it has really advanced to the æsthetic plane as a mode of artistic production and takes its ranks along with other means of artistic expression in monochrome.

Photography has, besides, made good progress all along the lines, and its entrance into art, which has not been without sufferance of violence, has been phenomenal.

The personal factor of the artist has been able to show its influence to so great an extent, has entered so far now, that individuality of expression in the work produced by the camera is judged along with work by the etcher, engraver or water-color painter.

Of course it would be unfair to make comparison of the photograph with color brush work, but that, too, may come and eventually it will hold its own.

We all appreciate the benefit conferred upon our profession in the uplift of photography out of the rut it was in, which we owe essentially to the amateur worker, but along with our feeling of exultation and our gratitude to the non-

professional for the triumph assured in the struggle for artistic recognition, we regret the maintenance of exclusiveness of the advanced exponents of photographic art, their dogmatic insistence that they alone are the people, and photographic art will terminate with them, for it is a mistake to hold that art appeals only to a coterie of elect ones.

A work of art at the present day derives its inspiration from conventional good taste rather than from any ecstatic emotional feeling, and photographic art in particular should recognize its mission in administering to this tendency of the times, instead of trying to address itself to sensationalism or touching upon the domain of imaginative art.

"Art for art's sake" may be well for those who delight themselves solely with the mere contemplation of opposing masses of light and shade where the motive of the picture is either vaguely considered or even utterly ignored, but the sane mind which is practical and productive, rather than abstract and visionary, finds more agreeable sensation in concretely presented subjects with which photography is intimately concerned.

It is fortunate, perhaps, after all, that those photographic artists who hold to the cult of "art for art's sake" are of the elect few, that they are exclusive and that their views are not significant to mortals of ordinary artistic perception. Trained, as they are, to appreciate and enjoy only the peculiar charm of novelty of method, finish or execution, they lose the delight of the beauty and truth of conception of which execution or finish is but the vehicle.

The initial error of those inoculated with the high art bacillus, the ultra impressionist photographer, is in the possession of the idea that he is making a picture, when at the best he is only giving us a sort of shorthand note of his artistic impression. He calls his work "an effect," "a study." Well, that is merely what it is, and we have nothing against his contention, if he would only stop there and let both of us look on it merely as the means to a desired end; but we protest when he foists it upon an art-appreciating public and insists that it is "Art, true Art, and nothing but Art."

Blotches of various shades, even on an old weather-beaten wall, may, if imagination amend our perception, recall clouds and woods and deep pools of water among the everlasting hills, or even the beauty of the human face; but where the initial impulse has not been provocative in the stimulus of the imagination, these same blotches, shreds and patches of light and shade are undeciphered hieroglyphs, unmeaning, unintelligible accidents, and we get no more pleasure from the contemplation of them, either as Nature's casualties or Art's deliberations, than we do from the casual blot of ink unwittingly spilled upon a white page and let to run wild in the direction of least resistance.

Technical accuracy, far from detracting anything from the value of a work of art, often enhances the range of its dramatic power of expression.

All that is demanded in our photographic art is sincerity and saneness in our pictorial endeavors, and a resistance to the narrow dictates of any cult of Art.

SUITABLE MOUNTING

FRAMING a pictorial work has always been considered an important act. Few painters are indifferent as to the style and character of the isolating medium which differentiates their finished work from the background of the wall on which it is hung for exhibition.

To the pictorial photographer the subject should be of equal importance, for much of the character of the impression his picture makes depends upon suitable mounting and framing.

Unless the mount and frame are harmoniously associated with the photographic print, they do positive injury to the effect. There can be no neutral ground in mounting and framing.

In former days, photographs, as far as color is concerned, were confined to certain tones. The range was limited to various shades of brown and purple to black; but nowadays "motley is the wear," and unfortunately the photographer still imagines that he may indifferently call into service any sort or color for isolation, and indeed is governed more by current fashion than by any scientific or artistic principles.

It is not an uncommon practice for the photographer, who has spent much time, care, and even taste, in deciding upon the character and tone of his print, to leave the matter and choice of framing to the cabinetmaker, trusting to the intrinsic merits of his picture to triumph over its surroundings. There is little truth in the saying, "beauty unadorned," for we cannot judge of anything unless by comparison with surroundings.

We could wish that the subject of mounting and framing might be reduced to some constant principles for guidance and not be left to individual fancy, which, being untrained, is quite as liable to go astray, as to direct taste in the proper artistic channels.

We have said that modern photographic work is produced on almost every variety of color value, and we believe that the proper course to pursue would be to study the value of contrast and harmony in color. The changes which are produced in colors by contrast have reference to brightness as well as fulness and to hue. They play a most important part in painting, as well as the other chromatic arts.

In photography the theory of simultaneous contrast dares not be neglected. While the artist who affects color in his photograph (and just think of the great color range in gum-bichromatic printing) may abandon himself with tolerable success to his feeling for giving expression, it is absolutely necessary for him to know the laws of the phenomena of contrast. These he must be familiar with if he wishes to avoid groping about in indecision, if he desires to reach his aim without the necessity of endless experiment, which, after all, may conduct only to imperfect issues.

We are all familiar with the simple experiment of placing a small disc of white upon a black ground, and of the effect produced after looking at the white disc for some little time on transferring our glance to another sheet of

gray ground. We see upon this latter ground a dark image of the white disc. Instead of a white disc use a colored one, and the image upon the gray will also appear colored, but its hue will be that complimentary to the original disc. If a red disc is used, the after-image, as it is called, will appear bluish green; in case of a yellow disc, it will be blue, etc.

If, after having fixed our eye upon an object for a sufficient time, we look upon a surface of the same color as the object itself, the after-image will appear faint and whitish; if the surface looked upon is of the complimentary color to that of the object, the after-image will appear deeper and more brilliant than the rest of the surface. To show this, you need only fix your eye upon a bluish green disc on a gray ground and then turn suddenly to a bright red surface; the after-image of the disc will appear of an intensified red.

If we look upon a colored surface, after having fixed our eyes upon an object for a sufficient time, the color of the after-image will appear in a mixed color. If the object is green the after-image appears violet, if seen upon a blue surface; but faintly green, with a tendency toward gray, if seen upon a green surface. Such after-images might be called negative, because they hold the same position to the object producing them which the photographic negative holds to the original.

The physiological law governing these phenomena is well known, but the framer and mounter can hardly be expected to take interest in the story, especially as it involves a consideration of psychological action on part of the spectator.



"THE GOSSIPS"

BELLE JOHNSON

The changes which colors undergo when placed in juxtaposition are amongst the most important means of pictorial representation in the hands of the artist, and for the purpose of reaching certain definite effects a detailed knowledge of these changes is quite indispensable.

The contrast between "light" and "dark" being the simplest case, is the first to claim attention of the photographer. In this paper we shall confine ourselves to discussing the effect of contrast in black and white, reserving the consideration of the contrast of colors for other papers.

If we place a given hue, a medium gray, for instance, such as we have in platinum bromide or Velox prints, upon two different grounds, one of them lighter, the other darker than the gray itself, the latter will assume a different appearance in each of the two cases; that is to say, in the first case it will look darker, in the second lighter. This experiment may be very conveniently made with crayon papers of different shades. If we cut two pieces of moderate size from a sheet of such paper, and then lay one of them upon a lighter, the other upon a darker sheet, it will seem incredible that both pieces were really cut from the same sheet of paper, and the fact that they are really identical in color can only be realized by placing them side by side. The most remarkable fact to be observed is this, that the disc, the true brightness of which exceeds that of the ground only by a very little, looks almost as bright as that upon the ground which is almost black, while in the same manner a disc upon a ground only slightly brighter looks almost as dark as the one on, say, a perfectly white paper. It is therefore evident that the small discs suffer a change of brightness by contrast with the ground, and that the smallest perceivable difference in brightness between the two surfaces produces almost the same effect of contrast as that produced by the greatest contrast which can be conceived. This remarkable "effectiveness of small differences" is of very great importance in photography.

COLOR PHOTOGRAPHY AND ART

CONSIDERABLE improvement in the various schemes of indirect rendition of the colors of Nature has been effected, and so the question is, "Has the limit been reached and are the results indicative, that it is useless to try to get a closer approximation to color values as presented to normal vision?" If this be the case, will the artist accept what the photographer offers as a solution? In other words, does the painter consider that photography in color is an artistic method of production in the strict sense of the word?

Let us look fairly at the problem before jumping to conclusion. Even granting the inadequacy of any photographic method to give true color rendition, we have to admit that photochromy, while playing the rôle of a mere copyist, and at times actually falsifying the avouch of artistic color perception by reason of its too great precision, will, nevertheless, habituate the eye to see correctly and so give ability to condemn the mere conventional ideas of color values. In this particular it will line up many a painter who is untrue to Nature and lessen the



value of his work by comparison with its own. Its influence in educating the eye will be more powerful than all that books on the subject may suggest. If this opinion be accepted, we may reasonably inquire what does the future hold in store for pictorial representation?

We know what effect the discovery of photography had upon the art of that day and how, on the whole, its influence was healthful in removing art from the narrow channels of conventionality; and may we not, therefore, anticipate a like happy renaissance in our present-day exploitation of art. There is opportunity indeed for such a mission to reclaim art from its presumptuous Icarian flight. It is, however, not to be expected that even if the consummation of a perfect color scheme be reached, that painting will be relegated to desuetude. On the contrary, it will stimulate the painter to higher efforts and restrict him at the same time to legitimate means for expressions of truth, and in no way hamper his flight into the realms of the imagination.

Painted work will always maintain its prestige. Even in artist's work, inferior as representation and in execution to pictures by the lens, there would be little danger of photography supplanting, because personal work has its appreciation and is more tangible than it can be manifest by photography, where the manual intervention is the minor factor.

By a sort of inherited atavism, the emergence of the personal sub-consciousness, we will always retain our confidence in the taste and knowledge of the painter and look to him more directly for the immediate pictorial expression of what delights us in Nature. Still we shall not unfairly disregard what photography may present by show of artistic feeling, skill in execution, control of factors, expression of individuality and emphasis of the personal equation.

In monochrome reproduction the photo-artist may call to his aid any means mechanical or chemical to modify the impression he has made by the agency of lens and sensitive surface.

Retouching, therefore, is a legitimate agency to effect a work of personal expression and to make us appreciate all its beauty, so that to a certain degree it is within the capacity of the artist with the camera to suppress, where demanded, obtrusion by detail, and vary the actual scale of gradation, so liberally made use of for effect by the painter.

The question is pertinent—Is it, or will it be, at any stage of development of color photograph equally within the power of the photo-chromist, to call upon such means of personal expression?

At its present stage it is apparent that there is but narrow latitude of execution for amelioration of initial effect. The artistic image will be conditioned by the fidelity of the reproduction of the colors, or the expression lessened by the complexity of details. The colors, obtained under ordinary conditions of light, necessary to impress the image, must of necessity be crude, and even under exceptional atmospheric conditions, in greater contrast than is compatible with the scheme of artistic relative tone and so the æsthetic interpretation of Nature made extremely difficult, if not impossible.

The personal equation is held too much in abeyance, and all that individual-

ity of feeling so characteristic of the best monochrome work eliminated. The polychrome could never suggest, as does the pictorial monochrome, the work of the brush of the great painters.

There is so little chance of expressing the particular comprehension and idealization of the subject. The artist who elects the polychrome is reduced to acceptance of some favorable presentation correspondent to the exigencies of imposed conditions at the moment the subject may be photographed. The improvement of the methods, however, may effect much and afford better opportunity for the personal touch.

The very few, really beautiful reproductions give hope that the feat will be eventually accomplished and the blending of colors better realized, but we think this shall be realized only by an abandonment of the restraining methods of research so persistently adhered to. The academic procedure of working upon what is really an obstructive theory of color is putting unnecessary clogs on progress. What has been done is certainly marvelous, but it is not the solution of the problem of color photography. Meanwhile, let us not do despite to monochrome photography, which, in the hands of the photographers, has given the world such beautiful rendition of Nature according to the fancy or inspiration of the artist.

INSURING GOOD RESULTS IN THE ENLARGEMENT

THE "enlargement" as it is technically designated, is the most popular presentation of the photograph with the pictorialist, and there is good warranty for this partiality. At one time the enlargement was considered only as a basis for artist work with pencil and brush, which implies that it was an imperfect form, and not an intentional medium for artistic exploitation.

The perfection in negative practice, the flexible mediums furnished by the gelatine plate and printing papers nowadays, enables the pictorialist to so control the evolution of his picture in the enlarged form that it is made his ultimate object and the small picture merely a means to end.

But it often happens that the artist, in enlarging, discovers that his anticipation of fine work is not realized.

In a great many cases it will be found that the cause of disparity in results between what is expected and what is presented, is due to the fact that the operator really calls upon the negative in hand to do something it is not capable of, not that the negative, *per se*, may not be a thing technically good, but simply because it is called to service to effect what its virtues are in opposition to. A negative, for instance, may look charming to the eye, be what the technician calls brilliant, but it is just this brilliancy which incapacitates it for the special work.

Such a negative has not proportionate density; that is, the densities of the high-light areas are not in a ratio, so as to register in the print (enlargement) variation, corresponding to what the eye may see in the negative when viewed

by transmitted light (looked through against a bright surface). Take a portrait negative, for instance, so looked at, the vision presents a range in intensity between the white of the flesh tones, the white of the collar on the model and the whites of the other draperies, and so, apparently, warrants a like presentation in the enlargement, which is not realized, because the general density is too great to be effectively reproduced; the exposure necessary to bring out the impression, say from the most intense part, overimpresses the parts of less intensity and the nice differentiation of the high-lights is not exhibited, with attendant disappointment and perhaps some adverse remarks about the medium used in the enlarging.

Now, what is the remedy? Simply to study how to develop the negative so as to make it accommodate its character to the purpose wanted. To keep the negative to that degree of thinness in the high-lights that by the time the detail in the deepest shadow is visible, the proper density of the highest light (collar in our example) is just attained and then stops.

Of course, this implies skill in development, but remember, it is proper development which is the *sine qua non*.

Development is a fine art, and worthy of all the study it demands. The pictorialist is too prone to snub technique.

Another cause contributory to undesired results is to be traced to the mechanical structure of the negative.

Closely examine the negative for enlarging when it disappoints and you may see a decidedly visible coarseness of grain, especially if the plate happens to be a very rapid variety, which is likely to be the case.

This coarseness is an inherent fault of rapid emulsions. Slow plates invariably have a finer grain, not that we imply that it is not impossible to make a fine grain fast plate, but merely to emphasize the need of observation as to the character of the grain, since there is a liability of exaggeration of coarseness which is preventable. We mean that its condition, in this respect, may be due to bad manipulation in the negative's evolution (see the necessity again of respect to technical work). This exaggeration of grain may be occasioned by improper development, too rapid evolution of the image, and particularly by too rapid drying of the film, and perhaps by incautious use of potassium bromide in the developer.

Few photographic artists take into account this coarseness, and their attention only is excited when they discover the effect in the enlargement. They wonder at the lack of sharpness and falling off of gradation in it, not taking into consideration that it must, of necessity, be more apparent in the large areas and their association.

We said something about the superiority of the "thin negative" over the brilliant negative, for the purpose of enlargement, but do not misinterpret us.

By thin negative we do not mean weak negative, one had by over-exposure and imperfect development. Such a character of negative is really contributory to coarseness. We say again, we mean a negative properly proportioned in densities to accommodate to enlarging.

BLACK AND WHITE AND SEPIA

THERE seems to be no general principle governing the judgment of the average pictorial photographer in selection of color tone, with reference to the character of the subject portrayed.

Decision in determination of what color to employ seems to be influenced more by the intrinsic attraction of tint, as affecting individual taste for mere color, than for that which is essential or contributory to interpretation of sentiment or feeling in the motive of the picture itself.

With some, too, taste for color is controlled altogether by the prevailing fashion.

The consequence is that the color, not infrequently, is chosen for a particular subject, which is anything but compatible with the motive which the picture is intended to express; and it needs no argument to prove that the picture, instead of being made by the color, is oftener marred thereby.

Now, there can be no neutral ground where safety is in the selection. The subject must first of all be considered.

Pictures may be conveniently classified as portraits, landscapes and genre or incident pictures.

In portraiture, taste in color choice veers from black and gray to sepias, and, occasionally to reds, Bartolozzi red. The warmer tints are more in evidence where youthful subjects are represented.

Black and white are preferred for portraits of women, almost universally



"RUNNING HOME"

F. J. MORTIMER, F.R.P.S.

for men. These black tones, to be sure, incline somewhat to what might be called the warm shade, which is exhibited in platinum and fine bromides.

Vignetted heads, whether of young or old, are decidedly more acceptable in black, gray or the warm black tones.

Deviation from black tones is permissible in those cases where the beauty of the subject is of more consideration than truth to likeness. That is, where flattery of model is indulged in.

This may account for the frequency of warm tones in any kind of portraiture. With regard to landscape, there is considerable more latitude in selection of color permissible to keep the picture safely within the category of the artistic.

That is to say, any deviation from the color particularly adaptable to the subject, is not apt to be followed by disaster as would occur in portraiture, because the subject itself is a constant check upon taste going too far astray.

Warm tints, certainly, are most appropriate to summer sunny landscapes and cold bluish tones and black to scenes of the inverted year. Snow scenes in particular demand the cold tones.

Our common sense prevents the printing of a snow subject in brown or sepia.

But on general principles, black is a safe tone for any variety of landscape, particularly as we can have black tones warm or cold.

If we examine any landscape where the atmospheric effect is most delicately brought out, we discover that this especial feature, so contributory to beauty of effect, has been invariably secured by soft gradation of black and white, which is never so well presented in sepia or brown, because the ratio of gradation is greater in the black and white scale.

This is especially manifest where distant prospect is shown in the picture, and it holds whether the landscape presents the rich warm tones of summer, the more delicate tones of autumn, or the contrasts in a winter scene.

The cause of this is manifest. It is a physical one. Gray tones recede, other tones approach the vision.

In genre pictures the greatest latitude of all presents, because of the varied nature of the subjects. The choice is, therefore, subjected to much perplexity.

In turning over the pages of several art publications to try to get the artist's opinion, we are not helped much, since we find no general principle of guidance in selection. The choice seems arbitrary, various tones being indifferently employed.

On the whole, however, when in doubt in determination, the safest is recourse to black and white.

Be sure, however, that the blacks are true blacks, not rusty blacks, rich luminous and softly gradated tones, through grays up to delicate whites, with limited areas of extreme intensity.

In black and white, the suggestion of Nature's colors is better presented than in the other tones like sepia and brown, warm as they are regarded.

The scale of variation from intense black to the highest white is much greater than in any other monotone.

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A New Precipitant for Silver

The silver which is not in the finished picture is in the fixing solution. The developer and washings contain mere traces, probably mechanically separated. On the large scale the recovery of the metal is a matter of importance, but amateurs and many professional photographers do not find the procedure worth while. As the hypo solution is not affected by sodium chloride, resort is usually had to sodium sulphide, which throws down silver sulphide. Recently a German chemist has suggested the use of a substance commonly called sodium hydrosulphite. It is manufactured in large quantity for certain dyeing processes. It is a powerful reducing agent, and when added to a hypo solution throws out silver in the metallic form and restores the bath to activity. Some confusion in names has unfortunately occurred in regard to the sulphur compounds. The fixing agent used in photography has the formula $\text{Na}_2\text{S}_2\text{O}_3$ and was mistakenly called "hyposulphite." It really is more closely allied to sulphuric acid, and is now called in all chemical works "thiosulphate." The true hyposulphite, Na_2SO_3 , seems not to have been obtained, but the compound noted above, the formula of which is given by Molinari as $\text{Na}_2\text{S}_2\text{O}_4$, is often called hyposulphite, and is, indeed, so called in the number of Chemical Abstracts, which refers to the use of it. It is now being advertised in Germany for the purpose of renovating fixing baths. The cheapness of hypo in the United States will probably make this phase of its action of little importance, but for the recovery of silver on the large scale it will doubtless find use.

Correcting Distortion

Quite recently a number of excellent portrait studies were sent to us for reproduction. They were excellent examples of posing and lighting, but, unfortunately, the whole effect was nullified by the distortion apparent in the lines of the background.

The artist's attention had been so intensely riveted upon the salient features that he overlooked the counteracting influences. We reproduced these pictures, but corrected in the copying the defects.

So much has been written about distortion and the way to prevent it that we do not need to touch upon the methods of obviating it. We merely confine our remarks to the not so well known method of copying a distorted view, so as to give it the appearance of a properly taken picture. That is, we shall show how to cure bad cases of convergence or divergence of perpendiculars.

Let us take one of the unfortunate cases of architecture we sometimes see as evolved by an inexperienced photographer with a camera not constructed to take such subjects.

A case where the convergence is upward. Does it not suggest itself to you that the most reasonable way, the only way, in fact, to make these lines parallel is to use a non-distorting lens in the copying camera and one of short focus to make the copy of as short a focus as is compatible with the covering of the plate sharply when used with a very small stop?

If the camera is placed straight and squarely before the distorted image to be copied you will notice that the image on the ground-glass reproduces all the distortion of the original. But if now the top part of the original picture be inclined a little out of its upright perpendicular position forward toward the camera you notice the effect on the ground-glass. The convergence begins to disappear until you get your lines parallel, as they should be. Now insert your small stop, because the upper part of the image on the ground-glass is necessarily out of focus with the large diaphragm. Owing to the tilting the rectangle of the original view will be thrown out some. That is, it will be somewhat wedge-shaped; but this is easily remedied by cutting with a trimmer to the rectangular form. Diverging lines, of course, are rectified by a contrary tipping of the copy. Converging lines are, however, more frequently encountered by the copyist.

The Tone in the Portrait

Photographers are accustomed to misusing the term tone in its connection with photography until the word is finally applied to mere distinction of color, as when they speak of sepia tone, purple tone, red tone, etc., but just at present we are going to confine it to its legitimate application to pictorial work.

The value of a tone or shade is estimated by its importance as related to other tones or shades, being high or low, weak or strong.

When tones and shades are placed in a picture precisely as they appear in Nature, the picture is technically spoken of as "true in values." When the painter fails to get just relationship we say he is "weak" in values. When he exaggerates we say he is "strong."

Painters not natural in their representations are not called sensational artists, but we are apt to designate the cameraist who fakes Nature as "affected." This may be unfair discrimination on part of the art critic, but we have to remember this, that while the photographer may have just as legitimate right to depress or emphasize, he is compelled by the exigencies of his practice to be cautious not to venture too far over the borders.

Rembrandt, for instance, is a striking example of a painter of "strong" values, but the photographer who affects the "Rembrandt" must have a particular care not to go too close in his imitation of the great painter. That is, he dare not show the same degree of exaggeration.

Fra Angelico gives good examples of "weak" values. His pictures are delightful, but a close photographic following of his style would be "flatness" not endurable.

Sargent and Chase and Inness, on the other hand, are safe examples to follow, because their values are "true."

Generally speaking, the absence of value in a picture is noticed even by people who know little about technical art, who are possessed of natural taste, an eye for relation of light and shade. Still even if we have this natural intuition we learn only to fully appreciate values by comparing our own powers of observation with the representations of the painters. It is a revelation to most observers to note how their indefinite perceptions are brought out more forcibly to them by this comparison.

Things are not mere silhouettes against a ground, but full of air, light and shadow. They have volume and depth.

Upon the true rendition of the relation of depth of one tone to the other depends the whole effect of light and shade and the "atmospheric standing out" of one part of the picture from other.

In portraiture values are essential, but unfortunately it is easier to get an appearance of conformity to painted portraiture in the meretricious way by smear and smudge and blur, instead of by the true artistic way of subduing or emphasizing relations by control of illumination, for the true artist does not arbitrarily introduce in his pictures fictitious lights and shadows, but tries to reproduce what his artistic sense presents.

Perspective in the Background

There is evidence in some of the best portraiture of a revival of the scenic background. The abuse of landscape setting to the figure had much to do with the disuse of scenic grounds. The elaborate representation of a large variety of objects interesting enough in themselves, but not calculated to produce good effect when placed behind the model, had given place to the plainest of plain settings. Most of us became weary of the ruined castle frowning over a lofty hill, meandering streams and luxurious underwoods, with the sitter placed in a position which prevented her from enjoying the beauties of the scenery, or if she were so depicted, we had her leaning on an elaborately carved balcony, balanced by curtains and accompanied by a geometric-patterned mosaic floor. This was overdoing a good thing, and of course a reaction set in, and we went, as we always do, to the opposite extreme. The taste of the photographer was thought bizarre if he ventured upon aught but the plainest of backgrounds.

There is danger of running into monotony with the use of exclusive plain grounds, and our modern pictorialists have felt the necessity of some accessory to support the portrait which should not be merely neutral in its action, but positive in its effect. So we notice a growing and a healthy taste for landscape background, and scenic painters are complying with the demands of the profession by the production of much that is excellent.

But we have noticed that not infrequently these landscapes, though artistically everything that could be desired, are not always painted with consideration of the exigencies of the case, and the photographer is sometimes, if not always, allured by the intrinsic beauty of the painting to the shutting out,

to his judgment of its ill adaptation to studio limitations.

Frequently the illumination of the landscape is just the reverse to the lighting of the model; but this mishap is not likely to recur after the incongruity is pointed out. But the want of judgment in the study of the perspective of the scene, so as to have it in relation to that of the figure, is of more frequent occurrence, and more frequently repeated, because it happens that a knowledge of the principles of perspective is uncommon with photographers, and, for that matter, with scene painters and first-rate artists also. The chief difficulty arises in the portrayal of objects set, as it were, in a slanting direction toward the spectator, and it is in backgrounds containing such that the most ridiculous errors are perpetrated.

The perspective representation of an object consists in drawing it as would be done by placing a sheet of glass before the eye at right angles to its axis, the head held immovable, and with the hand tracing the object on the glass. Running across this plane a line is drawn, varying in position according to the height of the spectator from the ground level.

If the spectator were on a steep hill, this line would be high; if he were on a depression, it would be correspondingly low. This line is the horizontal line. Somewhere on it, preferably about the center, is a point representing the part opposite the spectator's eye. It is such a spot that if the axis of the eye were a tangent, the spot would lie at the junction of the axis with the horizontal line of the plane.

If we critically inspect any regular-shaped object, like a long table, for instance, and we look from end to end, the farther end seems the smaller, and consequently the lines joining the two ends—in other words, the sides appear to slant toward one another.

If we look up the lines of rails upon a straight and level stretch of road, we find they appear to converge and almost to rise until they appear nearly at the height of the eye.

The sides and roof of a house, the walls of a room, the casements of the window—every object around us possessing straight lines running parallel to the plane are other examples. The rules governing the convergence and their application to the model and the scenic background we shall endeavor to discuss in our next paper on perspective background.

Autumn Foliage by the Screen-plate Processes

The brilliantly tinted foliage of various shades inseparable from late autumn have always held a distinct attraction for the photographer, and more particularly for the color photographer, who looks upon his medium as a means of recording these transient beauties, accurately in permanent form, as color transparencies. That this is as it should be is amply borne out by the fact that many of the most successful landscape color transparencies represent autumn subjects. There are, however, some points having a special bearing upon color photography by the screen-plate processes that are evidently often overlooked by the majority of photographers.

Many color photographers by the screen-plate processes, when making a first attempt at a rendering of autumn tints, often make the mistake of including too large an area of the subject upon the plate, particularly if the finished transparency is intended for viewing in the hand, and not for lantern projection, in which case a much wider expanse of subject may be included, owing to the fact that the picture is seen upon a much larger scale. In the former case, an expanse of woodland, while very attractive to the eye, is not to be regarded as an ideal subject for color photography, for in reason the smaller the area included by the lens, and the larger the scale upon which the subject is rendered, the better. A group of two or three beech boles, well placed upon the plate, with a carpet of fallen brown or red leaves, interspersed with patches of green moss, and the rich yellows, reds and browns of the foliage, is often more effective, from the pictorial point of view, than one in which the subject is far wider in area and more varied and interesting. One of the greatest difficulties in selecting a subject for color photography may be said to lie in a full realization of what will make a fine color photograph, as distinct from what has naturally, by reason of its wider extent, a greater appeal to the human eye. The truism that the part is often greater than the whole is applicable to color photography, to an even greater extent than when the subject is rendered in monochrome.

The next point is that the colors should contrast. For instance, it is possible to select a composition consisting almost entirely of a beautiful shade of yellow. This will only look monotonous, but if the yellow tint can be broken up, as it were, and balanced with brown or red, or even green, a pleasing

composition may be produced. The ordinary summer landscape, for instance, formed almost entirely of greens, is for this very reason inclined to be uninteresting, unless a small amount of another color or colors can be introduced, such as flowers or human figures, wearing light or distinctive clothing, or even the red brickwork of buildings, that serve to break up the monotony. In the same way autumn tints should be as varied as possible, and in this respect the ideal subject needs only a little seeking by the thoughtful worker.

Contrast in the matter of lighting is also one of the problems of autumn landscape photography in colors. Many workers are inclined to neglect the study of this, to the detriment of their results. As is well known, the screen-plate color processes cannot give a very perfect rendering of very deep shadows and very brilliant high-lights with the same exposure. In most autumn photography under trees and in the woods the finest combinations of colors are usually to be found, where the inequality of the lighting is a factor that demands special consideration. Some photographers, when attempting woodland photography in the natural colors of the subject, seek to obtain pictures in naturally isolated surroundings that will allow of the production of a perfect technical result without seeking to overcome the difficulties that arise when extremes of contrast in the lighting are in evidence. The results in the former case, though accurate enough from the scientific point of view, often leave much to be desired in the matter of pictorial qualities, and the matter of obtaining a good transparency from subjects differing widely in their lighting contrasts is not one that is to be shirked in this way if the worker really wishes to produce something worth while.

In illustration of this I may mention an experience of my own. Only last autumn I was photographing upon Autochrome plates the beautiful tints and color contrasts of a certain stretch of woodland near my home. In the course of the day I came upon a most beautiful color composition, both from the point of view of contrast and balance of the colors. The lighting, however, was the problem. Shafts of mellow sunlight striking down through the half-bare boughs of adjacent trees lit the golden yellow foliage of a giant beech to perfection and also picked out in rich brilliance the reddish brown of the fallen leaves upon the near foreground. From the scientific point of view the subject was one impossible to transcribe into a perfect Autochrome. The background, con-

sisting of holly and fir trees, received hardly any light at all, while the brief exposure needed, to secure a good rendering of the upper boughs of the beech, would allow of no detail in the foreground, which was, of course, less well lighted. Determining to make the best of things, an exposure was made, after a careful meter test, which, from what I remember, over-exposed the lightest part of the picture fully six times, while it left the "second lights," if the term may be coined for the purposes of description, slightly under-exposed, while, of course, the deep shadows were grossly under-exposed. I should mention, however, that when composing the picture the camera was so directed that as little of the darker background was included as possible. This is a most useful dodge, and may, with a little maneuvering, allow of a presentable rendering of many a subject that might otherwise have to be passed by. The plate was developed with the usual tabloid "Rytol" developer, at the same strength and for the same time as indicated in "The Wellcome Photographic Exposure Record and Diary." After the second development it was found that the transparency, though satisfactory as regards the foreground, was rather weak in the high-lights through very considerable local over-exposure. The plate was then intensified by the chromium method, the result being a transparency of very fair quality. I need only add that it received an award at a large provincial photographic exhibition this last spring. I would advise those who are attempting Autochrome work upon the changing foliage of this autumn not to avoid entirely subjects having fairly great extremes of contrast, but rather to try the effect of a carefully calculated exposure, trusting what latitude in the matter of exposure the Autochrome plate possesses, which is more than some color workers would have us believe. The point to be noted is, that it is possible to compromise in the matter of the exposure required for subjects where the contrasts of the lighting are not too great and still obtain a very fine result, always provided this is effected without any undue lack of the required exposure in the more important of the shadows. This may sound a rather unscientific doctrine, but in practice there are cases where it is worth while following it out rather than pass by an otherwise fine color subject. One other point may be profitably mentioned, more in the light of a warning. Autumn tints in this country are very transient, and at their best may be looked upon to last only a few days if the

weather conditions favor this; while if this is not the case, the foliage may be at its finest only for a matter of a few hours. Many workers make the mistake of making the exposure before the foliage assumes its richest colors, while others are inclined to take up too much time in thinking about the suitability of time or subject, so that when they do finally make up their minds the leaves have fallen and the boughs bare, for the finest colors are only taken on by the leaves just before they fall. Another factor that often tends to add to the color photographer's difficulties is the strong wind that so often accompanies the bright days of late autumn, though if a sheltered wood is chosen any ill-effects that this might have upon the details of the subject while the exposures are being made may be greatly minimized. For my own part, I would advise that, if wind is troublesome, the exposures be deferred to another day; the only result likely is that of wasted plates, since a satisfactory transparency of autumn foliage demands the maximum sharpness of definition.—ROBERT M. FANSTONE in the *British Journal of Photography*.

The Tribulations of a Discoverer

Dr. Lüppo-Cramer has recently poured out his soul in complaints as to the foolish questions that have been put to him concerning his procedure. One set of queries was as to the length of time that the bath can be used. To this he answered that it can be used for a long while if impurities such as hypo and developer are kept out, but further queries sought more precise expression. He asks whether precise information is at hand as to how long a fixing bath or a developer may be used. Much depends on the character and number of the plates. Some workers have assumed that because it is stated that a chemical action takes place in the desensitizing bath, it must be soon exhausted, but that is not the case. He finally lays down the rule that as long as the bath has its normal red it is active, and, in fact, in the formula given he has intentionally prescribed a much stronger bath than necessary for ordinary work. One question deserves to be ranked with Rube Goldberg's series. One of the workers with the procedure having recommended hydrochloric acid as a decolorizing agent for the plates, remarked that as pure hydrochloric acid is not easily obtainable in the retail stores, the commercial should be used, upon which a question comes in asking whether the pure acid is applicable.

Earliest Mention of the Hand Camera

In the *Journal of the Royal Society of London* is a communication by the distinguished English physicist, Dr. Hook, dated December 19, 1694, which shows that the idea of a hand camera for artistic work was considered as a means for making sketches from Nature. We reprint directly from the *Journal*:

Among the instruments that may be of use to curious navigators and travelers, one is, for procuring the pictures, draughts, or true forms and shapes of such things as are, or may be, taken notice of by them; that is, not only of the prospects of countries, and coasts, as they appear at sea from several distances, and several positions, but of divers inland prospects of countries, hills, towns, houses, castles, and the like, as also of any kind of trees, plants, animals, whether birds, beasts, fishes, insects; nay, of men, habits, fashions, behaviors; as also of all variety of artificial things, as utensils, instruments, engines, ships, boats, carriages, weapons of war, and any other thing of which an accurate representation and explanation is desirable. For, though a description in words may give us some imperfect conception and idea of the thing so described, yet no description, by words, can give us so full a representation of the true form of the thing described as a draught or delineation of the same upon paper.

It is the interest of all such as desire to be rightly and truly informed for the future to promote the use and practice of some such contrivance as I shall now describe, whereby any person that can but use his pen and trace the profile of what he sees ready drawn for him shall be able to give us the true draught of whatever he sees before him that continues so long time in the same posture as while he can nimbly run over with his pen the boundaries, or outlines of the thing to be represented, which being once truly taken, it will not at all be difficult to add the proper shadows and light pertinent thereunto. By the same instrument also the mariner may very easily and truly draw the prospect of any shore, and from time to time denote the rising thereof, as he does nearer and nearer approach it, and the depression or sinking of it as he does recede.

The instrument I mean for this purpose is nothing else but a small picture-box, much like that which I long since showed the society for drawing the picture of a man

or the like; of the bigness of the original, or of any proportionable bigness that should be desired, as well bigger as smaller, than the life; which, I believe, was the first of that kind which was ever made or described by any. And, possibly, this may be the first of this kind that has been applied to this use, though upon the first institution of the Royal Foundation of Christ Church, I propounded it to the Governors there for the use of the children; but Sir John More undertaking to write an institution, and having omitted it, it has not been there brought into use.

Pictorial Work of Floyd Vail, F.R.P.S.

BY NICKOLAS MURAY

An unusually interesting exhibition of pictorial photography was recently held, on invitation by Mr. Floyd Vail, F. R. P. S., of The Camera Club, New York, at the Brooklyn Institute of Arts and Sciences.

The exhibition comprised a number of landscapes, excellent examples of the charmingly picturesque value one can obtain with the camera when possessing artistic imagination and grounded in the element of photography. The dominant note in the exhibition was the imaginative rendering of pictorial effects such as one rarely sees in work of this type, and the care with which views were chosen to conform to the poetic expression characteristic of his studies.

Not only is Mr. Vail content in his distinctive selection of his landscapes to impart an expression of individuality, but he goes further in his artistic development in manipulating with originality and skill his medium in such a way that his studies assume the sketchy freedom of etchings. In each instance the composition bears evidence of true artistic conception and attests to his masterly handling that makes for perfectly balanced pictures. Though it is a difficult matter to single out any particular picture as the best, there are a number that cannot be passed by without making mention of their fine qualities.

A study called "Boyhood" is worthy of comment, because of a feeling of natural simplicity that strikes the observer. A group of youngsters is seen playing in a shallow stream in the foreground in a manner which precludes any possibility of their having posed for it, giving that human touch which makes it so interesting. And yet one can see that the composition and lighting have not been sacrificed, for there

is an harmonious blending of group and surroundings, which makes for a complete whole.

A perfectly balanced picture as to light and shade is one titled "Passing Shadows," an interpretation of one of Mother Nature's sombre moods. A feature of interest is a bridge in the background which one barely discerns, due to the deep shadows into which it is thrown by a bank of overhanging clouds. The unusual intensity of shadow is explained by the fact that the side of the bridge presented to the observer is already in shade.

A study which contrary to popular conceptions of art, proves that there need be no set rules of composition, is one labeled "Early Springtime." A group of children almost in the center of the picture would afford a jarring note, were it not for the masterly way in which the sloping bank on one side and a patch of bushes on the other are made to complete a well-balanced design. A pond in the foreground and distant clouds floating over a group of trees in the background help to give an impression of perfect harmony.

A very fine specimen of Mr. Vail's work is one marked "Glendale." This picture appeals by its vigorous pictorial expression and decorative composition. There is something about this study that transmits to the observer a feeling of bigness and freedom. One can almost sense the sunshine and fresh air that is excited.

"Late Afternoon" is a wonderful example of how big spaces can be used effectively to make a pleasing result. There are a number of dark tones in this picture, still they blend with the lighter tones most beautifully, and afford a delightful contrast.

An interesting study in composition and one possessing a decidedly human quality is "Mist and Sunshine." A gnarled old tree with its withered branches, sharply defined in an engaging pattern against the sky, is shown well in the foreground, which is bathed in sunshine. The background below the hillside is in mist. One gets the impression of an old helpless beggar looking back over his dead past.

"A White Christmas" depicts a snow-storm scene in the heart of New York City. Very little detail, due to the intensity of the storm. In sharp relief two figures stand out strongly against the snowy whiteness. With backs turned to the observer and coat collars turned up, they are caught in a brisk walk to keep warm. Other

figures well ahead of these help to break up the monotonous white expanse of snow.

Interspersed among the landscape studies are a few portraits of an old gentleman in various guises. Prominent among these is one called the "Russian Immigrant," which possesses a decided individuality of treatment and courage of composition. A picture which otherwise would give one the impression of needing more space is well balanced by the proper use of a coat thrown over the arm, which at the same time helps to cut down in size a rather large hand prominent in the picture.

One comes away from this exhibition with a feeling that Mr. Vail has struck the keynote of artistic endeavor in this field by virtue of his imaginative vision in the selection of his landscapes, by his vigorous pictorial expression, and the ability with which he utilizes his medium in imparting to his points a rare and delicate beauty.

Colloid Chemistry and Photography

F. F. RENWICK, A.C.G.I., F.I.C.

In the part of Essex where I live the water supply is moderately hard, and in certain districts the water has to travel long distances through iron pipes, and often appears of a clear, pale-green color when run to a depth of 10-12 inches in a white enamel bath; moreover, a bath sponge in the course of a few months assumes a deep brown hue. The green color of the water is largely due to dissolved iron, probably in the form of ferrous carbonate. A wet sponge, from its highly porous nature, offers an enormous surface to the air, and the iron gets rapidly oxidized to ferric hydroxide, which stains the sponge brown. No amount of washing in the water of this district will remove the color. In the language of colloid chemistry the sponge strongly "absorbs" colloidal ferric hydrate. When, however, I visited Manchester early last year and took my brown sponge with me, I was at first rather startled on proceeding to use it, to find I was rinsing my face in a coffee-colored fluid, and thought the mischievous son of the house was up to some prank. It soon became apparent, however, that the sponge was rapidly recovering its pristine pale yellow color, and after a few days its appearance was nearly normal, but it reverted to its former muddy hue soon after my return home. In this domestic incident we have an excellent illustration of one of the phenomena (absorption) with which colloid chemistry concerns itself, and which are so common in almost every aspect

of photography. Indeed, it is not too much to say that photographic chemistry is more concerned with the chemical behavior of absorption complexes than with the more generally understood reactions of ordinary chemistry. This fact is not so well appreciated by photographers as it deserves to be, and therefore comparatively few have taken the trouble to acquire a knowledge of the elementary principles of that rapidly growing branch of science termed colloid chemistry, which deals with the peculiar effects that result when substances present an enormous surface in proportion to their mass.

The publication of a second edition of Lüpke-Cramer's "Kolloid-chemie und Photographie" should not pass unheeded by photographic chemists, or they will surely wake up one day to realize that they have slept while Germany made progress. Let us consider for a moment a few well-known photographic materials and processes from this point of view.

The difficulty of getting glass, which has once been emulsion-coated, sufficiently free from foreign matter for use a second time was well known to every photographer in the days when the collodion wet plate was the only one available, and during the war when large quantities of old negative glass were returned to the manufacturers for re-coating, it is probable that not a few cases of spoilt negatives were attributable to absorbed impurities which the cleansing process had failed to remove, while it is certain that the manufacturers had to spend so much time, money, and labor on the problem that many of them regretted having touched it.

Gelatin is a typical colloid, with as many outstanding problems as there are facets to a housefly's eye. Possessing nearly equally-balanced acid and basic characters it is capable of displaying the most diverse properties according to the milieu in which it finds itself. Both in its physical and chemical characteristics it displays a remarkable memory of its previous history, owing partly to its power of absorbing acids and bases and the hydroxides of the heavier metals, as well as a large variety of organic materials such as dyes, photographic developers, etc., and partly to the fact that solutions of gelatin near the setting point and the gels formed by further cooling possess some sort of complex physical structure which varies with the previous thermal treatment.

Paper again contains at least three, and generally more, colloids, viz.: Cellulose, resin and alumina, besides dyes and some-

times other materials such as casein, and earthy loadings (for example, kaolin or barium sulphate), all of which present problems to the student of colloid chemistry.

When we turn to the processes employed in the use of photographic materials we are again impressed with the enormous extent to which we are dependent on phenomena of a colloid-chemical character. Print-out emulsions, whether they have been made in gelatin or collodion (another typical colloid), contain silver chloride and citrate in a colloidal condition and the purple photographic image formed during printing consists of colloidal silver. There is also strong evidence for the belief that when we expose a dry plate and form a latent image this latent image likewise consists of an exceedingly fine-grained form of colloidal silver within and upon the surface of the silver bromide grains.

One of the characteristics of all colloids and fine suspensions is that the ultimate particles of which they consist bear electric charges, some colloids carrying a positive and some a negative charge, and when this charge is neutralized the particles are either thrown out of suspension or solution or the characteristics of the solution are markedly modified. These charges can often be neutralized by the addition of opposite charges attached to other atoms or molecules in the form of a solution of a mineral salt or by oppositely charged colloid particles. For instance, an excess of any acid suffices to supply the positively charged hydrogen ions required to precipitate the albumen from white of egg or rubber from the latex, a colloidal solution of alumina or ferric hydrate (positively charged) will form an insoluble absorption complex with a weak negatively charged gelatin solution. A suspension of fine particles of any kind, which may take weeks to settle, can be precipitated easily and rapidly by analogous methods, as is well known in connection with many systems of water purification. On the other hand, such suspensions, which are often very unstable, can be made extremely durable by the addition of certain colloids such as gum or gelatin. The possibility of preparing photographic emulsions largely depends on the stability conferred on the negatively-charged silver bromide particles by the protective action of the negatively-charged gelatin vehicle.

Other instances in which recent work in the department of colloid chemistry is of great assistance in guiding the experimenter in photography are the numerous applica-

tions of dyes, as color sensitizers, as desensitizers, as toning agents in the mordant process of dye toning, the use of various metallic salts for tanning the gelatin of negatives where it contains a silver image, or again in the study of the causes and the avoidance of discoloration of the gelatin of prints or lantern slides during toning in various solutions, and so on.

It is impossible in a short note to do more than touch upon a few of the colloid-chemical problems which photography offers so abundantly, but there is scarcely a single photographic operation which does not involve the application of some property peculiar to matter in the colloidal state, and photographers will do well to acquaint themselves with the contents of Dr. Lüppo-Cramer's book. For those unacquainted with the elementary principles of colloid chemistry, some general reading on the subject is advisable as a preliminary. Those who do not possess a copy of the first edition, published in 1908, should endeavor to procure one, since it covers a wider field than the second edition, which has just appeared, and which is devoted too exclusively to the author's own recent work to be a reliable guide for the general reader.

Many of the experiments he describes are very interesting, and must be accounted for by any satisfactory theories concerning photographic phenomena. It is perhaps necessary, however, to warn readers, since he seldom deals satisfactorily with other workers' views, that Lüppo-Cramer's explanations are not by any means generally accepted, ingenious and suggestive of further modes of attacking these problems though they often are.

It is, for instance, still an open question how far sensitiveness is due to each or any of the factors—the size of the silver bromide grains, the presence of colloidal silver (amicros) and gelatin in solid solution in these particles, or to their crystalline structure, and it is still unproved that chemical fog is due to excessive chemical reduction of the silver halide during the "ripening" process. In connection with these matters it is interesting to note his suggestion that certain dyes may produce chemical fog as a consequence of mutual precipitation of a positively charged basic dye and the negatively charged amicros of silver in ripened emulsion grains. This is equivalent to the writer's suggestions (see "British Journal of Photography," 1920, July 30, p. 466), with regard to the nature of the development process in general, that charged amicros of colloidal

silver do not, but electrically neutral silver gel particles do, operate as the active germ in development, but Lüppo-Cramer insists that these silver gel particles are always the result of a chemical decomposition of silver bromide by light, catalytically assisted by the dissolved silver amicros, in spite of the strong evidence that the energy available in the minimum amount of light which can give a developable image is insufficient for the work of splitting asunder one molecule of silver bromide per particle.

Again, Sheppard and Trivelli's recent work on ammonia gas ripening (see their monograph on "The Silver Bromide Grain") throws doubt on Lüppo-Cramer's explanation based on disruption by light of the silver bromide crystals, nor are Lüppo-Cramer's explanations of the phenomena of persulphate reduction or the action of dilute iodide solutions on dry plates by any means generally accepted.

His valuable work on desensitizers is too recent for any generally acceptable explanation to be possible, so that his view, that they act in the light as a mild type of oxidizer inhibiting the separation of bromine, remains an unsupported opinion at present, although some experimental evidence is put forward in its support. His observations on the powerful desensitizing action of the old ferrous oxalate developer are particularly interesting as explaining the difficulties in avoiding fog from unsafe dark-room illumination which were encountered during the transition from this to the modern organic developing agents.

Many observations concerning color-sensitizing are recorded, particularly in connection with the influence of the nature of the halide and its fineness of subdivision; these will interest a large number of practical workers. Indeed, all who are engaged in photographic research work will greatly appreciate this second edition, for it will save them much time and trouble in consulting Lüppo-Cramer's very numerous and widely scattered original papers.—The British Journal of Photography.

New Photographic System

Borough President Connolly, of Brooklyn, N. Y., has inaugurated the use of photographs in the preparation of damage and assessment maps in street opening proceedings, thereby saving thousands of dollars to the taxpayer.

The observing ones of the public have lately remarked with considerable interest

a change in the appearance of the assessment maps in street opening proceedings furnished by Borough President Connolly's Topographical Bureau. For the old small-scaled, hand-drawn index maps formerly used, neat photographic reproductions of the original draft maps have been substituted. As previously prepared, the index maps required the services of a very expert draughtsman, who to produce a passable drawing had to use a magnifying glass in his work, as the scale to which the maps were drawn was very small. Even by the use of the glass it was difficult to achieve a good result. The work was laborious and the cost considerable. The expense of the photographs now used is almost negligible, and after a little color has been applied the appearance is excellent. Any small defects in the large drawings from which the photograph is prepared disappear entirely on account of the reduced scale. Preparations are under way to further perfect the process by sensitizing the whole title page upon which the photographs are mounted and printing direct thereon, thus doing away with the necessity of pasting.

Shortening the Fixing Process

In *Das Atelier*, Hugo Sontag quotes a remark made in 1863, by Hardwich, of King's College, London, to the effect that as there is no specific sign of complete fixation, the duration of the process is uncertain. The wet collodion plate was rapidly fixed. The dry plate with its thicker film, is not so rapid, but the disappearance of the silver haloids can generally be observed, and by allowing a margin after the apparent termination, future trouble may be avoided. The paper-picture offers much greater difficulty. The lack of permanence of the older albumin-silver chloride positive was mainly due to lack of thorough fixing and washing. The duty of making such pictures and subsequently fixing and washing them was often confided to persons who were merely trained for the technical side and knew nothing of the principles of the procedures. Often the principal himself was not much better informed. Some operators use the bath sparingly, others fix a considerable number of prints in it, indeed some use it when quite discolored. Properly fixed and washed prints will be in good condition when many years old, if good paper stock and good adhesive have been used in the mounting. A 10% hypo bath with 10

minutes immersion has been found satisfactory and the rule may be followed with safety. With thin albumin paper, the moderate transparency will aid in determining the state of the fixing, but the opaque papers do not offer this advantage. In albumin paper, the image lies partly on and partly in the texture of the paper, but in celluloid and bromide papers, the impression is in a very thin layer on the surface of the paper. In view of these facts it seems rational to assume that if an albumin print can be fixed by a 10% bath in 10 minutes, a bromide print should be much more quickly cleared. This is found to be the case in the apparatus for making bromide copies of documents. As many as 1000 prints may be turned out in one hour, being in this period exposed, developed, fixed, washed and to a certain extent dried. Experience has shown that such prints last well, except as to a slight darkening of the image and a slight yellowing of high-lights, and an alteration of the apparatus will even remove this objection.

It is seen therefore that the fixation of bromide prints is a rapid process, and it seems reasonable in view of the fact that the image is only in a thin layer, not to immerse the paper support in the bath, the immersion involving long washing.

Sontag's procedure which he has followed with success for many years is as follows: The bromide paper, fastened to a board, is placed in plain water and during exposure a developer is applied by means of a sponge soaked in the solution. This is then washed off and the print fixed. Apart from the fact that excellent prints are obtained, but different from the ordinary bromide print, the paper support does not absorb any material amount of the developer or fixer and thus less washing is required. The procedure saves chemicals and the use of large dishes.

Experiments show that different grades of paper require somewhat different periods. A smooth bromide may be fixed in 5 seconds in a bath of 20% hypo, while a rough paper may require from 4 to 6 times that length. Sontag tested several papers for hypo (with permanganate solution) and found satisfactory conditions. He also tested the pictures by exposure for several weeks to daylight without any noticeable change occurring. The brief time that the fixing takes avoids the absorption of any appreciable amount of hypo into the paper. Further information on the subject is promised.

Substitutes for Phenosafranin

Lüppo-Cramer in *Photographische Rundschau* reviews work recently done by him in comparing some of the substitutes for phenosafranin that have been offered. It was claimed that certain green and red dyes have decidedly desensitizing effect, with the advantage in not staining the fingers. Careful tests showed this claim to be unfounded. Plates developed with the use of phenosafranin gave entire freedom from veiling, but the same kind of plates developed under exactly similar circumstances except the substitution of the colors named were hopelessly fogged.

Aurantia, the desensitizer, brought out by Lumiere and Seyewetz, is not in any way suitable for the uses to which phenosafranin is applied. Lüppo-Cramer tested the effect on the sensitiveness by treating unexposed plates with the several solutions and then comparing the decrease of sensitiveness. Fogging took place with aurantia with both preliminary treatment and treatment just before development, while phenosafranin prevented all such action. Lüppo-Cramer says that aurantia may serve for autochrome plates as these are relatively insensitive, a statement which sounds somewhat strange as it is usually considered that autochromes require great care in the light in which they are developed, and Lumiere and Seyewetz recommended aurantia for plates not sensitive to red light. It has already been noted that the strong solution of aurantia in acetone has been withdrawn from sale on account of its irritant action. It must also be borne in mind that vapors of acetone are poisonous, and the long use of such a solution in the unventilated dark-room will be dangerous.

Lüppo-Cramer regards the statements that the substitutes offered do not stain the fingers, as of little practical importance. If the amount of phenosafranin used is reduced to the minimum at which it will desensitize satisfactorily, little trouble from the staining power it noted, especially if the plates are fixed in an acid bath, and left in the bath a few minutes after the fixing seems complete.

The annual exhibition of the Portland Camera Club, Photographic Section of the Portland Society of Art, will take place as usual next spring, March 3rd to April 2nd, and the closing date for entries has been set for February 15th.

Notes from Foreign Sources

From La Revue Française de Photographie

Quatreboeufs present a long communication entitled "A new Technic in Artistic Photography." After alluding to the disputes between the sharp and soft focus advocates, and the general principles of portraiture, he describes his procedure as follows: Two plates are exposed at once, one back of the other, with the coated sides towards the lens. In this way one sensitive film is in sharp focus and the other slightly out. The exposure must be lengthened by about one half as much again as otherwise, but the two negatives, when superposed, should have about the density of a normal single one. The first negative should be developed superficially, as it gives the details and the outlines; the second negative, which gives the atmosphere, the modeling and the true values should be thoroughly developed. Practice will indicate the exact method to pursue to get satisfactory results. To make the positive, it is, of course, necessary to superpose the two negatives exactly as they were in the exposure. When this adjustment is made they should be fixed by binding strips. Positives are obtained in the usual way, the negatives having been placed so that the emulsion of the positive is in contact with the sharper image. Any retouching or local reduction or intensification should be done on the soft negative. Such retouching should be done broadly so as to preserve the soft focus of the negative. The sharp negative should never be retouched. Several photogravures illustrating the procedure are given in association with the article. They show satisfactory work.

SPECTROGRAPH STUDY OF SAFRANIN ACTION. Bonacini made experiments with panchromatic plates desensitized by safranin, in comparison with similar plates not so treated, using a Rowland grating, the periods of exposure being different in the two series so as to get an equal effect in the blue region. The conclusion reached is that the sensitization is not uniform throughout the spectrum, the action being greater in the regions corresponding to the chromatic sensibility (which can completely be annulled) than in the region corresponding to the basis sensibility of the emulsion. The action is the same in the ultra-violet as in the blue. Spectrograms obtained on a panchromatic plate by placing before the slit of the spectrograph a screen tinted with

safranin show that the real protection by the coloring of the emulsion would be limited to the green radiations. The fact that the sensibility of the red is sometimes less diminished than the sensibility or the green, (as with plates treated with pinacyanol), suggests that a yellowish-green light should be used with desensitized plates, instead of a red of the same illuminating power, in fact panchromatic plates, after desensitization, can be manipulated with no more precautions than ordinary plates which have been subjected to the same treatment.

PRESERVATION OF DIAMINOPHENOL DEVELOPERS. Bunel has found that a small amount of lactic acid will serve as a preservative for this developer, without interfering with its efficiency, the action being as satisfactory as several other less available agents. Good results have been obtained from a solution seven weeks old, kept in a partly filled bottle from which portions were taken from time to time. Ordinary water is used. The following formula is given:

Sodium sulphite, dry	30 grams
Lactic acid sol. (Sp. gr. 1.21)	5 c.c.
Diaminophenol hydrochloride	5 grams
Water to make	1000 c.c.

MERCURIC NITRATE AS A REDUCER. Steigmann calls attention to the action of a nitric acid solution of mercuric nitrate as a reducing agent of the same type as Farmer's solution, but having the advantage of keeping for a long while. A 5% solution of the nitrate is acidified with a few drops of nitric acid. A cold saturated solution of mercuric sulphate also acts as a reducer, but very slowly.

A Memorial to Henry Fox Talbot.—Three monuments have been erected in memory of Daguerre—one at his birthplace, one at the place of his death, and one at Washington, D. C. The last was dedicated in celebration of the fiftieth anniversary of the announcement of the discovery of the process. A statue of Niépce and a bust of H. Bayard have also been dedicated, but up to the present no monument has been erected to the memory of Henry Fox Talbot, who took a preponderating part in the early development of photographic procedures. The Royal Photographic Society has undertaken the collection of funds for such a memorial, and it is pleasant to note that French journals are favoring the movement.



Pocket Movie Camera Here

The first one of vest-pocket motion-picture cameras arrived in New York, October 17th, by the Cunarder "Berengaria" in the possession of C. D. Barton, of Wellington, New Zealand, who served in the war with the Anzac and is now a motion-picture operator. He bought the little thing in Paris for \$100. Its capacity is twenty-five feet of regular film. He did not have to grind a crank, as with the big machines, but merely touched a spring and the film clicked off.

Mr. Barton suspects the new camera will be in demand among society folk because of its handiness, the simplicity of construction and ease with which it may be operated.

A Reliable Mountant

The following preparation will keep many months:

Best laundry starch in powder	1½ ozs. avoird.
Gelatine, best (Cox's or French "gold label")	120 grains
Alcohol, 95 per cent... ..	1 fluid ounce
"Formalin" a 40 per cent. solution of "Formaldehyde" in water	30 drops
Distilled water	16 fluid ounces

Soak gelatine in water and heat to boiling. Rub down starch in a mortar with cold water to a cream and pour the hot gelatine solution upon the starch gradually, stirring all the time, till an evenly transparent paste forms. When nearly cold, mix alcohol and "Formalin," and stir well into paste, and *at once* pour into wide mouth jar and cover hermetically.

Concentrated Phenosanfranin Developers

In connection with his protests of unnecessary questions, Lüppo-Cramer gives two formulæ for concentrated developers as follows:

Paraminophenol Developer (similar to Rodinal)

A—Water	125 c.c.
Paraminophenol hydrochloride.	20 grams
Potassium metabisulphite....	80 grams
Potassium bromide.....	4 grams
B—Sodium hydroxide (of good quality)	70 grams
Water	90 c.c.

In preparing solution B it must not be forgotten that much heat is produced when

sodium hydroxide (caustic soda) is dissolved in water and mixture is best made in a regular laboratory beaker. The caustic should be added in divided masses, and handled with forceps, or the fingers protected with rubber cots. When B is quite cold it is mixed with A, by which some heat will again be caused. The mixture is allowed to cool, filtered and to every 200 c.c. of filtrate 10 c.c. of a 1% solution of phenosafranin added. A flocculent precipitate will separate, but whenever the mixture is to be used it should be well shaken and then diluted as with Rodinal (that is, with about 20 times its weight of water) when the precipitate will dissolve.

Glycin-suspension Developer. In a somewhat large mixing dish 50 grams of glycin and 39 grams of potassium metabisulphate are well rubbed together, and then 200 grams of potassium carbonate are added, mixed with 180 c.c. of water and the mass rubbed up to thin suspension. To this are added 25 c.c. of 1% safranin solution. The latter is at once precipitated, but is redissolved if any portion of the mixture is diluted with 10 to 15 volumes of water.

In tank work, in which a highly dilute solution is used, the proportion of the desensitizer must be increased so as to get the proper concentration. It is best therefore to add the color in proper amount after the dilution has been made.

In the case of mercury vapor, illuminated by the instantaneous flash of an aluminium spark, it has been found that the vapor remains non-luminous during the period of excitation and for about 1-15000th second after, subsequently bursting out in a flash of green fluorescent light. This appears to be the first observation of a fluorescent or phosphorescent body remaining dark during the period of illumination. Other substances have been observed with a new type of phosphoscope which records the phenomena of phosphorescence to 1-400000th second. Nothing analogous in its behaviour to mercury vapor has been found up to the present time, however.

It is only freshly formed mercury vapor which exhibits the phenomenon of fluorescence. No trace of visible luminescence is shown by mercury vapor at any density, or by any light stimulation, unless metallic mercury is present and liberating nascent molecules. It is believed that these are diatomic when they first leave the metal, subsequently breaking up into monatomic molecules.—Chemical News.

Recent Patents

1,388,870. Camera. In a camera, the combination of a casing having an exposure chamber therein, a focusing mirror movable to and from a focusing position, a part co-operating with said mirror and thereby forming an exposure shutter, a movable operating part, and means operated by said part when moved to open said shutter and move said mirror from its focusing position.

1,383,543. Photographic Apparatus. In or for photographic exposing apparatus a pair of side-by-side matched lenses in front of the exposure plane, a longitudinal transparent reflector in front of the two lenses with its plane extending between them, and a single light blending reflector between each lens and the transparent reflector; whereby diagonally entering light rays will be reflected and transmitted to produce two images, one reversed with respect to the other.

1,385,476. Camera-Shutter Control. In combination with the spool winding shaft of a film-roll camera having a shutter actuated by a spring-pulled cable, a ratchet wheel mounted on the shaft and turnable therewith, a plate mounted on the hub of the wheel and turnable thereon, a spring-pressed pawl on said plate adapted to engage the ratchet wheel, and a cable attached to the plate and extending to and branching from the shutter cable and movable therewith, the teeth on the wheel being so positioned that the pawl on the plate will freely slide over said teeth when the plate is turned by the moving of the cable to actuate the shutter, said direction of movement being opposite to the direction of rotation of the ratchet wheel when the latter is turned to wind the film-spool.

1,390,336. Time-Switch for Photographic Purposes. The combination, in the herein-described time-switch for use with photographic printing boxes, of a clockwork and an electric contact-making device mounted at the inside of the cover of the said box, means for winding up the clockwork, and means to actuate the said contact-making device when the winding-up mechanism is released, the said winding-up mechanism comprising a slidable actuating spindle, a plate secured to one end of the spindle and having integral downwardly projecting arms, a second plate fitted over the spindle and at a certain distance from the first plate, a spring mounted between the two plates and tending to keep the same apart, means to guide and support the said spindle and the plates, and a flexible steel band, of which one end is attached to the said arms and the other end fixed to the clockwork casing for winding up the clockwork-spring, all as and for the purpose set forth.

1,388,423. Shutter for Cinematographic Apparatus. In a cooling arrangement for the lamps of projecting apparatus, the combination with a rotatable, truncated, conical shutter, of a fan associated with said shutter, said fan being constructed to direct the cooling air through its whole periphery, and means for rotating said shutter and fan simultaneously and also causing the feeding of the film past said shutter during the operation of the apparatus.

1,389,992. Photographic Camera. In a folding camera having a lens plate adjustable to different positions, a shutter-operating mechanism thereon, a latch for said shutter mechanism also supported by said lens plate, a film-winding spindle, and a trip for said latch operated by movement of said spindle, said trip being mounted on the camera case and having a part engaging said latch in different positions of adjustment of said lens plate but disconnected therefrom.

1,391,870. Exposure-Indicator. An exposure device for photographic shutters comprising a movable aperture adjusting member, a scale having a plurality of different light character indications connected thereto and movable therewith, and shutter speed indications for each of said light character indications whereby the aperture formed by the adjustment of the member indicates automatically the appropriate shutter speeds for each of the light character indications.

1,387,811. Exposure-Meter and Finder for Cameras. The combination with a camera having a compartment in its front upper corner, an object lens in the front wall of said compartment, a view lens in the top of said compartment, a light-excluding wall disposed on the top of the camera about said view lens, a reflector within the compartment between the object lens and the view lens, means for regulating the size of the opening in which the object lens is located, and there being a distinctive mark formed on the front wall of the compartment above the object lens and below the view lens.

1,389,615. Photographic-Printing Frame. A photographic-printing frame comprising a frame having an exposing opening, a glass mounted in said opening, and a mask, negative and card-registering means back of said glass adapted to receive and register masks of different sizes, whereby the print or picture may be produced with a uniform margin, said registering means consisting of a pair of angularly disposed bars mounted in immovably fixed positions at the back of and adjacent one corner of said glass, combined with a closing cover, said cover being provided upon the back with a pad having cut-away parts in registration with the said angularly disposed registering bars.

1,389,742. Colored Image and Process of Producing the Same. The process of producing a colored image from a photographic image, which consists in replacing at least a part of the original photographic image by an iron-toned image and mordanting a suitable dye to the toned image.

1,392,144. Portable Camera-Support. In a portable camera-support the combination with a guide block, of legs pivotally connected thereto, engaging means on the legs, and a rigid plate adapted for direct removable connection with said engaging means for forming a rigid and inflexible support.

1,393,108. Daylight X-Ray Film-Developing Tank. A developing tank comprising a developing compartment, means for supporting a film container above said compartment and means extending downwardly and upwardly in said compartment and adapted to be connected with the film within the film container by means of which the film may be pulled from the film container into the developing compartment.

1,389,268. Photo-Printing Box. A photograph-printing machine of the character described comprising a printing box provided with an inclined cover having an opening therein, a translucent plate for said opening, a clamp for holding a film over said plate, a clamp finger for holding a printing paper over said film, a platen movable toward and from said opening, and a type-carrying member yieldably mounted in said platen and movable therewith for the purpose set forth.

1,391,982. Photographic Film-Supporting Frame. In a device of the kind described, a frame comprising side rods, a top bar and a bottom bar, upwardly projecting piercing pins connected with said top bar upon which one end of a film strip may be engaged, and adjustable film strip engaging means connected with said bottom bar, said engaging means having downwardly projecting piercing pins upon which the opposite end of a film strip may be fastened, said engaging means being movable longitudinally to stretch tautly the body of said film strip.

1,392,327. Folding Stereoscope. A folding stereoscope comprising a rigid hood member, a flange on the forward end of said hood member, a lens-carrying member within said hood having a pair of lenses, a rigid picture-carrying member corresponding in shape with the hood member, a flange on the rear end of said picture-carrying member adapted to fit around the flange on the hood member and form a closure therefor, end extensible connecting means secured to said hood and to said picture-carrying member whereby the picture-carrying member can be extended for use.

1,392,516. Photo-Film Clip. A photo-film clip, comprising a spring-carrying member, two jaws carried by said member and spring-pressed toward each other thereby, said two jaws being curved with their convex sides toward each other so that they engage substantially along a line, said two jaws being provided with one or more registering pins and holes arranged on such line of engagement.

1,392,759. View-Finder for Photographic Cameras. A view-finder for photographic cameras comprising an objective lens, a reflector and an image screen to receive an image from said reflector, means for mounting the finder on a camera whereby the reflector and screen may be rotated into different positions about an axis parallel to the optical axis of the objective lens, and a device rotatable relatively to the reflector and screen and also rotatable relatively to the finder mounting means and located adjacently to the objective lens for delimiting and positioning the field projected by the objective lens and reflector onto the screen.

1,390,247. Film-Moving Mechanism for Motion-Picture Cameras. In a film-moving mechanism for motion-picture cameras, a hinge pin, a side plate supported upon the hinge pin for oscillatory movement, a guard plate secured to the slide plate for oscillation therewith, feed fingers extending through said guard plate and engaging the perforations of a strip of film received between said guard plate and said slide plate, means for operating the feed fingers, locking pins extending through the slide plate and engaging the film perforations, and means for oscillating the slide plate to move the film into and out of engagement with the locking pins.

Photography in 1787

While browsing among some of the old books in the Mercantile Library, of Philadelphia, we came across an odd volume, entitled, "Rational Recreations in Natural Philosophy," by W. Hooper, published in 1787. Among the recreations suggested is the following: "How to Print Letters by Sunlight." The directions given are to fill a glass decanter with a solution of lunar caustic (fused nitrate of silver), mixed with chalk and aquafortis of the consistency of cream.

Then, having pasted paper models of the shape desired on the outside of the decanter, place it in the sun. The glass will turn black, leaving the space occupied by the paper designs white.

This is more than fifteen years before the experiments of Wedgwood (1803).

Lovejoy Gum Prints

Dr. Rupert S. Lovejoy, of Portland, Maine, gave a one-man show at The Camera Club, New York, by invitation, during the month of November, 1921, consisting of thirty-seven examples, all of which were in gum except one oil print.

Dr. Lovejoy as an artist strives more for decoration than representation; in fact, into some of his motives the latter purpose seems not to have entered. Therefore, to enjoy his exhibition, or properly estimate the merit of it, one had to judge it from his standpoint entirely.

His work, in the main, is more æsthetic than pictorial. However, some of his examples—to treat the latter phase first—depict middle-distance and distance, awaken emotions, suggest moods and spirituality. Among these, a very beautiful motive was "Aftermath," which disclosed a battlefield with a dead soldier as a prominent foreground object, the terrain stretching out to a great distance; the warrior's black hat forming a fine balancing spot; a canteen, discarded, suggesting the last drop drained to quench the dying thirst; no sign of any weapon indicating that fatigue or weakness had compelled their abandonment in aimless wanderings in search of safety and asylum. The expression of deep gloom emphasized the gruesome spectacle and completed the purpose of the artist to awaken a pathetic emotion.

Likewise, "Between the Lines—Dawn," rendered a group of skirmishers leading an early attack, well spaced, obscure in the grey dawn, all beautifully attractive in the distribution of light and shadow, broad in treatment and charmingly suggestive of an encounter and its consequences.

The nudes, of which there were a number included, were all most unobtrusively handled, the lineal beauty and natural charm suggested only, with a total absence of vulgarity and suggestiveness. These served as an excellent object lesson for workers in this feature of pictorialism.

"Nude Study" (29) was especially attractive, with its accent of forefront light, charming contours and graceful lines. More indefinite still, but equally beautiful, was "Nude—Sunlight and Shadow," which depicted the custom of a model entering a studio from the dressing-room, at first enswathed in a wrap concealing the figure, which is shortly thrown open to reveal the beauty and symmetry of form. In this motive the treatment is firmer but still re-

fined and most attractive. "Nude" (5) was most satisfying in pose, lines and other features, but would have pleased more if the extra rough paper on which it was produced had not somewhat marred the skin textures and nuances of light.

The decorations were beautiful inclusions. "The Misty Morn" was very appealing. "Nature's Spires" was a very choice bit, well spaced and rendered. The pattern of "Maine's Stormy Shore," its harmony of values and subtle differentiations, called for recurring contemplation. "Golden Autumn" was a faultless composition. "Prelude—Night" was full of poetic and romantic beauty. "Luring Silence of the Night" was convincing and most enjoyable, and was liked as well as any of the decorative motives. "Diana Rides the Night" was full of expression of solitude and the spell of a witching hour. "A Summer Symphony" was charmingly peaceful, nicely designed and decoratively satisfying.

"Lure of the Snowshoes" was the only oil print displayed and was particularly attractive for its textural excellence.

"The Old Homestead" delighted by its lighting and shadow masses. "Nocturne—The Temple" was a perfect specimen of moonlight feeling and accompanying gloom. "Decoration—Lion's Head" would have been a masterpiece but for the inclusion of obtruding overhead leaves; and the same may be said of "Moonlight—The Fens, Boston."

Dr. Lovejoy's exhibit was uniformly mounted as to size and color, which added to the general appearance. Altogether the show was greatly enjoyed by the large audience that attended.

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Toxic Cases From Carbon Tetrachloride

Carbon tetrachloride is frequently used in fire extinguishers, and quite a number of accidents, even fatal, have occurred by its use. It is stated that when it is applied to burning material or is poured on red hot metal plates it is decomposed into carbon oxychloride, chlorine and hydrochloric acid. It should, therefore, never be used for extinguishing fires in closed rooms, but only for open-air fires. It may be added that the vapor of the tetrachloride is highly dangerous itself indoors, being heavy and consequently easily accumulating, and so exercising its powerful anesthetic action.—Druggist Circular.

Celluloid Solution

A correspondent of the "Pharmaceutical Journal," writing on the making of varnish from celluloid, says: The best celluloid is old Kodak film, cleaned both sides. It makes no difference whether exposed or not. I use:

Clean film 1 oz.
Acetone 10 ozs.
Amyl acetate 10 ozs.

First polish the article with anything liquid or paste. Then thoroughly clean with plenty of methylated spirit and soft rag. Set aside to dry—say half an hour—then polish up again with a clean polishing cloth or chamois, apply the lacquer with a soft, large brush; use plenty, and leave to dry. Another correspondent, Mr. R. J. Stratton, writes: My experience is that ordinary clear celluloid (such as old photographic films, cleaned from emulsion) is sufficiently soluble in acetone to form a thick syrupy solution, but that the solution dries semi-opaque with a patchy whitish appearance. If, however, equal parts of amyl acetate and acetone are used, the film formed on drying is perfectly transparent. A smaller proportion of amyl acetate might suffice; this could easily be decided by experiment. —The British Journal of Photography.

Aptitude for Photographic Work

Alfred Bischoff, in an editorial in *Photographische Chronik*, discusses at some length the application of psychologic tests in the selection of those who desire to take up photography as a profession. The general system has been designated as "Psychotechnic" and investigations may be carried out in several ways. The statistical method requires much time before the results can be tabulated. The questionnaire is much used. It is quite suitable for some classes of employment. The impromptu test, that is, subjecting the applicant to various tests without previous notice, is often used. An elaborate and systematic investigation as to the traits, capacities and other important attributes of the person examined, is the best method. It is claimed by those who advocate these methods that it is possible to determine definitely whether a given person will or will not succeed in a given line of work. The methods must, of course, be adapted to the vocation chosen. Bischoff states that many large establishments have adopted them and the results have encouraged others to un-

dertake the work. The firm of Carl Zeiss has pursued the plan since 1918, with excellent results. The method was somewhat in use before the war, and it is stated that it has been extensively employed for several decades in the United States, which is, however, news to most Americans. The advantages of such selection as these psychotechnic methods permit are not merely the discovery of individuals who are suitable for a particular work, but the elimination at the start of the unfit. Under the older methods it frequently happens that a person undertakes a line of employment, and discovers in time his unfitness for success in it, but it is then too late to undertake a new line.

Bischoff discusses at some length the qualifications for a successful photographer. His standards are somewhat strict, and have reference almost entirely to studio work. It is a matter of course, that the photographer should have sharp eyesight, good color vision and good physical condition.

Great improvement, the author believes, would follow the general application of these methods in any country. If in any given examination, the result should show unsuitability to a particular line of work, in many cases the really suitable avocation could be determined, and thus the workers would be distributed in such manner as to be of the greatest use to their fellows. Investigations must be conducted in a spirit of kindness towards the subject, who must appreciate that the tests are for his best interest. The question has been brought forward by Bischoff in the main to encourage further discussion of it. It may, however, be a question whether industries and especially photographic industries are yet so thoroughly disciplined to permit of an extensive application of the tests.

A similar problem arises in connection with school children. Enough is now known of the mental, moral and physical differences of children to convince anyone that a selection should be made in all schools from the earliest period to the final year of study, by which those of slower or imperfect condition shall not be allowed to keep back the higher types. A good deal of work of this character was done in the selection of recruits during the late war, but application of the methods to schools will involve much greater difficulty, arouse much more criticism and even serious hostility.

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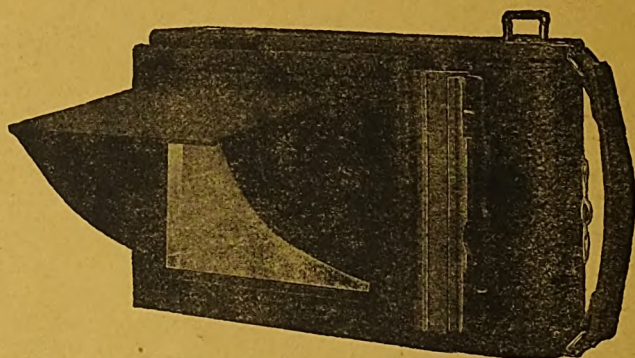
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The earliest silver print on paper, was made by William Henry Fox-Talbot, an Englishman, in 1836, the original being still in the possession of his son. Five years later, Fox-Talbot patented what he called the "Calotype" process of making negatives on paper. This was largely used by amateurs of that period, the more complex Daguerrotype having the preference among professionals. The use of albumen for giving gloss to the paper surface was a valuable contribution made by Fox-Talbot.

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THE photographic records which tell the picture story of the Civil War were made by the "wet plate" method. This process was discovered some years after Sir John Herschel (in 1839) made the first negative using glass as a base.

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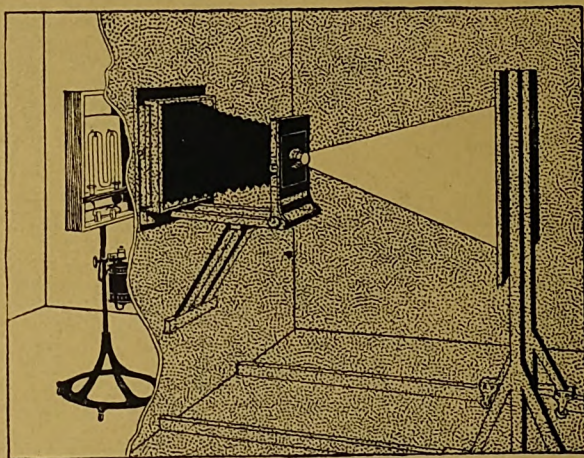
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Boycotting the Sun ~

IT was a long step from the tedious daylight processes that ushered in the advent of printing-out papers, to the simple exposures of gas light. But this was accomplished in 1893, by Dr. Baekeland, who, at the age of thirty invented and placed upon the market, the first developing-out paper.

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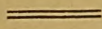


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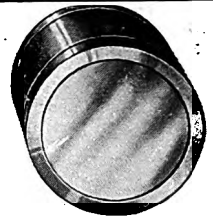
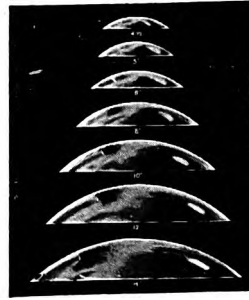
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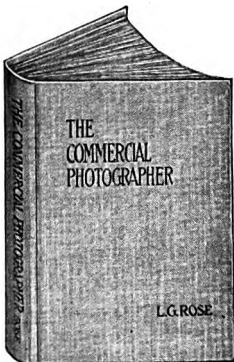
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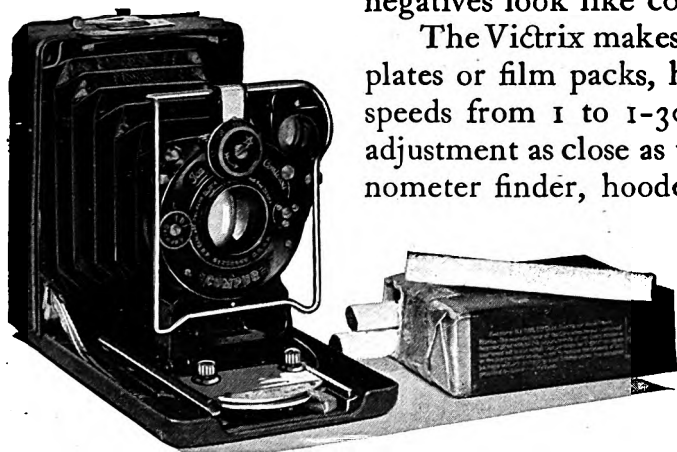
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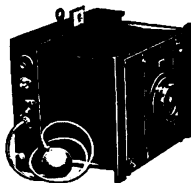
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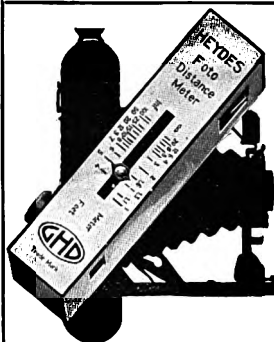
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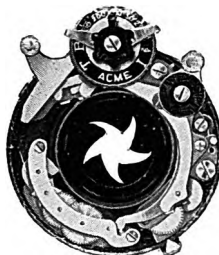
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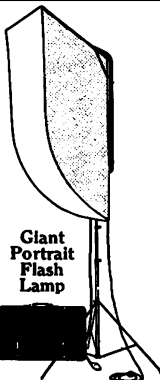
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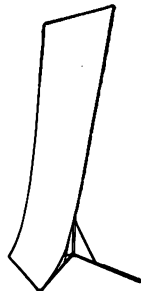
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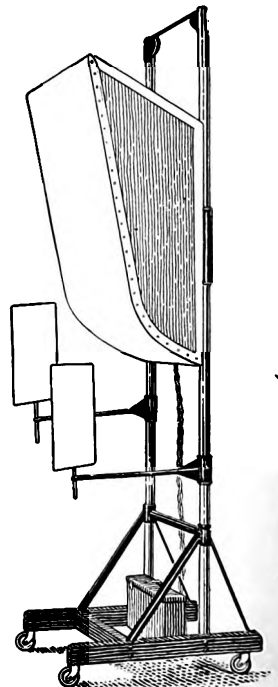
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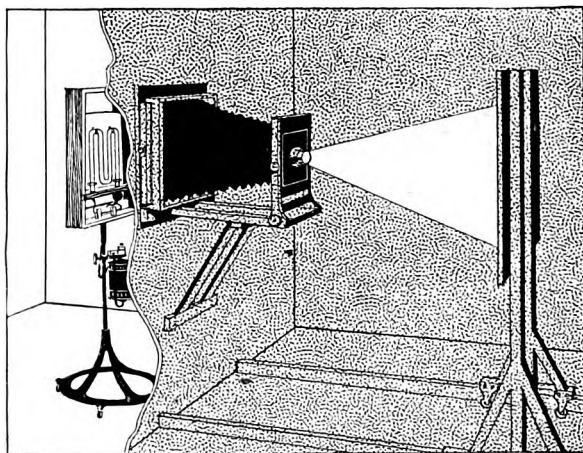
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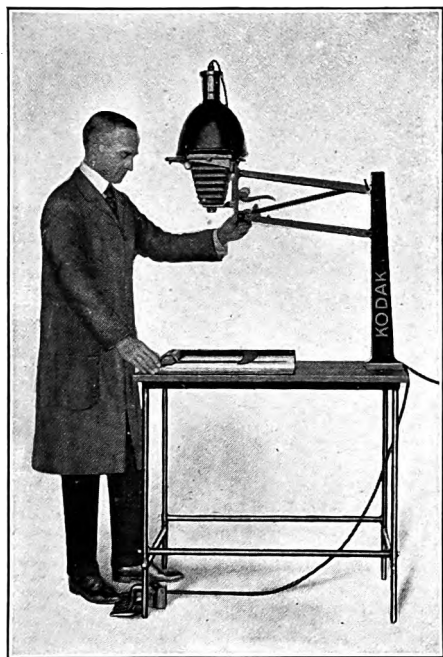
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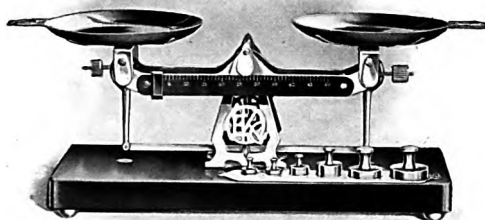
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At prices the same as for D. W. Artura Iris

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

The scale we made for you



The Eastman Studio Scale

(Avoirdupois)

Designed for convenience—built for accuracy. Bearings are of hardened steel, weights are accurately turned and tested, a beam with a sliding weight dispenses with small loose weights, so easily lost or misplaced—a sturdy, practical scale built for a lifetime of service.

Eastman Studio Scale \$4.50

EASTMAN KODAK COMPANY

ROCHESTER, N. Y.

All Dealers'

*The best trimmer is
the most economical trimmer*



EASTMAN METAL TRIMMERS

are instruments of dependable accuracy and their substantial construction insures a lifetime of service.

Eastman Metal Trimmers are furnished in three sizes with metal beds ruled with white lines in one-half inch squares, also accurate brass rules.

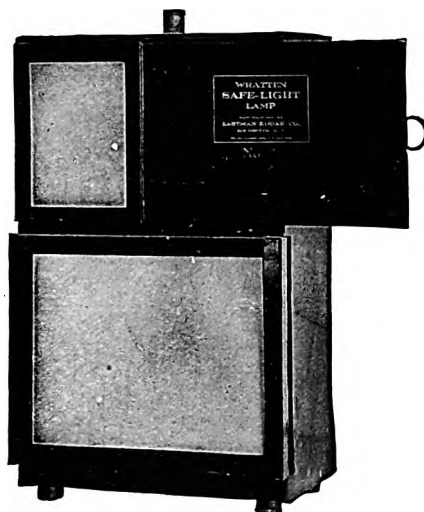
The Price

No. 10 — 10-inch blade and rule	\$15.00
No. 15 — 15-inch blade and rule	20.00
No. 20 — 20-inch blade and rule	25.00

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

*Use the light that
is soft—that has vol-
ume—that is safe.*



WRATTEN SAFELIGHT LAMPS

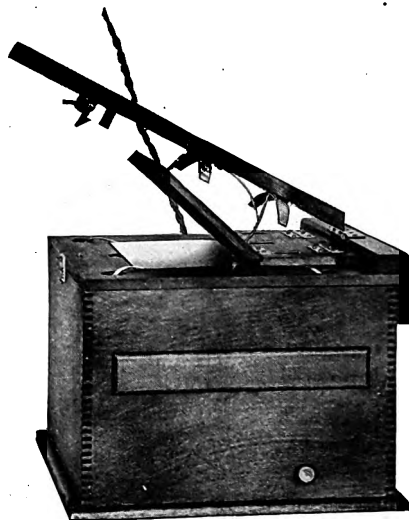
Produce a soft, indirect light that does not cause eye strain. The Safelights are spectroscopically tested—they transmit a great volume of light but it is light which can be used with safety. Series 2 Safelight furnished with lamps unless otherwise specified. Safelights are interchangeable.

Wratten Safelight Lamp No. 1, as above	\$10.00
Do. No. 2 without slide for white light	7.50
Series 1 Safelight for film or plates, not color sensitive, 8 x 10	1.25
Series 2 Safelight for orthochromatic film or plates, 8 x 10	1.25
Series 3 Safelight for panchromatic film or plates, 8 x 10	1.25

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

*For the rush
season—an
extra printer.*



The No. 1 Eastman Printer

A thoroughly practical, quick acting, strong and convenient printer for all sizes of negatives up to and including 5 x 7. Burns two 60 watt lamps and a pilot light. The lamp sockets are adjustable as to position.

The price with red lamp, electric
cord and plug \$20.00

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

The print that tells a positive
story of the quality of your
negative is the print on

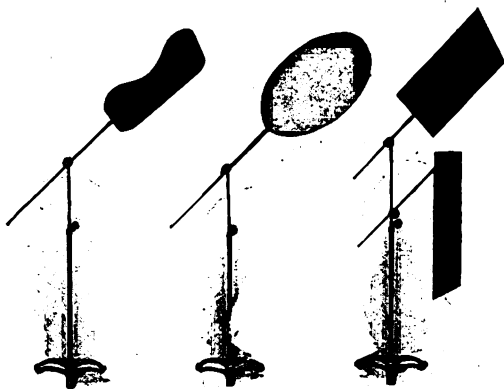
ARTURA

*The paper without a
disappointment*

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

CENTURY HEAD SCREENS



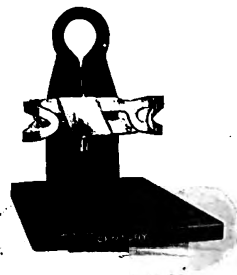
*Practical
Studio
Equipment*

Century Head Screens won't wobble or topple. The solid, wide base prevents that; and the ease and dispatch with which they may be adjusted to the desired height or position—and locked there—constitute a practical convenience.

*Prices: Century Head Screens Models A or B \$11.00
Century Universal Head and Side Screen 15.50*

CENTURY BABY HOLDER

This holder is adjusted easily, quickly and quietly to firmly hold the child in the position desired. The seat is broad and there is no possible chance of slipping. Handsomely finished in weathered oak, with metal parts oxidized.



Price: Century Baby Holder \$6.75

See them at your Stock House or send for descriptive catalogue.

Eastman Kodak Company

Folmer & Schwing Department

ROCHESTER, N. Y.

The organic chemist calls it
monomethyl paramidophenol sulphate—
its simpler name is

ELON

We recommend it for the development
of photographic papers because

We make it—we know it's right.

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

Where you have failed
to reproduce the life and
sparkle of a lighting with
plates, you can succeed
with

EASTMAN PORTRAIT FILM

Par Speed—Super Speed

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

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taken from the Building**

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